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ARCHIVES

OF

MEDICINE:

A RECORD OF PRACTICAL OBSERVATIONS, AND ANATOMICAL AND CHEMICAL RESEARCHES CONNECTED WITH THE INVESTIGATION AND TREATMENT OF DISEASE.

STORAGE

EDITED BY

LIONEL S. BEALE, M.B., F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;
PHYSICIAN TO KING'S COLLEGE HOSPITAL, PROFESSOR OF PHYSIOLOGY, AND OF GENERAL AND MORBID ANATOMY IN KING'S COLLEGE, LONDON; HONORARY FELLOW OF KING'S COLLEGE.

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The two plates of Chromolithographs, illustrating Mr. Lee's Paper, will be published in Part VII., as they are not yet ready.

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CLINICAL OBSERVATIONS.

A CHAPTER IN CLINICAL MEDICINE. WHAT TO OBSERVE IN DIPHTHERIA.

By W. Ogle, M.A., M.D., Cantab., Physician to the Derby Infirmary.

IT is generally acknowledged that clinical records are very unsatisfactory. They are either too long or too short; too diffuse or too curt; too particular or too indefinite; too opinionative or not sufficiently attested; or, more commonly, they have all these faults in combination. They are diffuse and opinionative on some points, even egotistical, *usque ad nauseam;* and therein they are too long and too particular; at the same time, they are too general, or altogether silent on other matters, and this makes them lifeless, and practically too short. These defects are easily seen when the work is done; one's own notebook is full of them; the difficulty is to avoid them *ab initio.*

Each fault may be traced more or less directly to a common origin—the want of method. This paper therefore, is, in the main, directed to the advocacy of *Method in Clinical Medicine.* Diphtheria is chosen simply as an opportune illustration.

The first step towards the cure of a disease is to understand its nature and essence; we care not so much for its name, as for its nature; and its nature cannot be fully understood, without searching into its cause or essence. In the same way, when we wish to remedy any other evil, such as that which is before us, we begin by making a plain statement of existing defects; and, having done this, proceed at once to inquire into their origin.

The faults that have been specified may be classified into those of omission; those of repetition; and those of substitution of opinion for fact, with their opposites. Each of the three

requires separate notice; their opposites, being less common, need only be mentioned by way of qualification; for it must not be deemed an excellence to exclude every expression of opinion, to condemn repetition under all circumstances, or be thought possible that a record can be made so perfect as to give *every* important particular.

In any case of sickness, there are so many things which might be recorded, that the omission of some of them is a necessity. But as we cannot tell, *à priori*, what to omit, the difficulty can only be dealt with indirectly; and the first thing which seems worthy of note is, that the inconvenience does not arise so much from the fact that certain characteristic features of a case are omitted, as that those which are recorded are presented in no definite order, and without reference to any plan.

The rule that is for the most part followed, if rule it can be called, is for each person to note the facts, which, at the time of observation, are most striking to himself. But the same facts are not always equally pronounced in any two cases of the same disease; nor in the same case on any two occasions; nay, further, in the same case, and at the same time, the same facts will not arrest the attention of even two, different persons, if they act independently of each other. Different people omit different things, because they do not agree to record the same things; and facts, which ought to be mentioned together—almost in the same breath, are dissociated, because they do not happen, at the time of observation, to be equally striking.

It is not till we attempt to compare our records, that the inconvenience of this is perceived; but then it is too late to supply deficiencies. Prevention is the only cure; a definite plan of observation is the obvious remedy. If a plan be used, be it ever so imperfect—let it comprehend but one half of the characteristic features of the case—yet those that are recorded will be the same in all. As the same plan has been used in all cases, analysis will be easy; and each record will contribute, either by way of confirmation or of correction, to the former store of knowledge. Thus a plan has a constant tendency to reduce the number of omissions, and, meanwhile, by ensuring uniformity, it lessens the evils which arise from those that exist.

The objection to a plan that it is too troublesome to use, is not to be ignored, nor, on the other hand, is it to have more weight than its due. It is in accordance with our experience in other matters that method, in the end, saves time, and, therefore, trouble also. It is pre-eminently so in the study of medicine. With a plan, the work of to-day will further and make more complete that of yesterday; without a plan, we do and

undo with the same hand: we know not whether of the two, the more. But as a present trouble, though a minor one, has always more weight than an advantage which is wholly prospective, the objection must be kept in mind, and all that we can hope for, is, that it be not pressed until the plan itself and the mode of using it have been explained.

The second fault, that of repetition, has been already dealt with to a certain extent; this was unavoidable. Repetition is a fault very closely allied to that of omission, and the remedy is the same for both: it will however be useful to examine this fault by itself, and to trace it to its origin.

Under all circumstances, and especially in "case-taking," we should be careful always to finish one thing before we turn to another. It is obviously most difficult to avoid digressions, where every striking fact is a temptation to start aside. Unless we have some monitor continually at hand to warn us, we obey the impulse without a thought. Nothing is more common in a clinical record than to speak first of the pain (say in the head); then to start off to the condition of the tongue, pulse, etc.; and then finding, perhaps, that the pain ought to have been more fully described, we return and mention it once more. It may be, that now we discover that sickness often accompanies the pain; and this takes us back to the state of the stomach, and thence to the bowels, till we meet with some other fact that sends us once more to the nervous system. The result is, that a confused and ill-defined picture is left upon the mind, which is, to say the least of it, very unsatisfactory.

The remedy for this needless repetition is the same as that for omissions; we must have a plan of observation; all facts that are of similar import will then be grouped together, and that which is mentioned once, will be mentioned once for all. The plan must be such an one as will serve for general use; every other that special circumstances may require, must be based upon the general one. The determination, "*what* to observe" must be left, to a certain extent, an open question; otherwise we should be at fault in the investigation of every new disease, *i.e.*, under the circumstances which, of all others, most require us to proceed in a systematic manner.

But besides the natural grouping of the symptoms, there is a proper order to be observed. Thus, the condition of the tongue, of the stomach, and of the bowels, are facts, which not only naturally come together, but they arrange themselves in the order suggested by the anatomical relation of the parts. Similarly, in examining the chest of a patient, it is natural for

the observer to state first the symptoms which first present themselves, and afterwards those which are elicited upon a more close investigation. The shape of the chest; comparative expansion of the walls; condition of the muscles of respiration; are phenomena which present themselves to the mind, before those which are obtained by means of percussion and auscultation: still further, in listening, the sounds during inspiration come before those of expiration; and both, before the sounds of resonance; and of these again, cardiac resonance before vocal resonance; this, therefore, is the order which should be observed. Both the order and the association of symptoms are determined by simple considerations, which commend themselves at once, as being in accordance with nature. By taking advantage of these, one great objection to a plan—that it is burdensome to the memory—is removed. On the contrary, it is an assistance to it; whereas if the natural order is interchanged or reversed, the probability is, that some particulars will be forgotten; or, at least, an idea of incompleteness is left upon the mind.

The third fault, that of stating a conclusion, when a fact might be given instead, requires something more than the use of a plan for its removal; though it is less likely to occur with a plan than without one.

A case may be related with considerable fulness, and with all possible regularity and order, yet it may both be unsatisfactory as it stands by itself, and useless for comparison with other histories of the same disease; and all, because the observer has given the conclusion he has come to, instead of the facts on which his conclusions rest. Though the use of a plan will not of necessity remove this evil, it will have a tendency to do so; both by the way in which it will itself require facts and not opinions to be stated, and because the very act of using it implies consideration; the want of which is the principal cause of the defect.

It requires consideration to perceive that conclusions are not so serviceable as facts. Thus it is very common, and at the time seems to be of little importance, whether we say "pulse quick," or "very quick," instead of "pulse 100," or "140," as the case may be. But a moment's thought, and the wish to compare the action of the heart with that of the lungs, or the pulse of yesterday, with that of to-day, or of any other day, are sufficient to show that the opinion, "quick" and "very quick" is of comparatively little value; whereas the simple statement of the number of beats per minute is all that is wanted.

It may sometimes be more easy to draw an inference, than

to state clearly the grounds on which it is based; but when the value of facts is fully apprehended, the extra trouble that they demand, will not be thought worth mentioning.

Besides this, there are so many things that cannot be given otherwise than as conclusions, that facts are the more valuable, being necessary to give a substance to the history. Of the pulse, the number of beats per minute, and the regularity of the impulse, are facts which we can ill afford to spare, when so many other characters, its being "full," "compressible," "thready," "bounding," &c., can only be given as matters of opinion.

Nevertheless, there are certain general conclusions which, when expressed in a natural manner, impart life and reality to the scene. Such are those which tell of the hopes and fears of the medical attendant, or the reasons for pursuing a particular line of treatment; but it is necessary that they be introduced naturally; they must be given with all the freshness which they have at the time that they occur to him, and not foisted in as after-thoughts, than which nothing tends so much to shake the confidence in the truthfulness of the narrative.

This faculty of giving life to the subject without being egotistical, is most difficult of attainment. It is probably very near akin to, if not the natural fruit of, that largeness of heart, which is combined with humility and singleness of aim, and which marks the true philosopher. It is, therefore, worth cultivating for its own sake, though it claims attention in this place on account of its practical value in a clinical record.

Bretonneau's cases are quite a study in this respect; the reader is carried on with the writer by an impulse almost irresistible; his interest is excited, and, as a natural consequence, the facts make a much more lasting impression than would otherwise be possible.

It will occur to many, that a plan is likely very much to check the expressions of opinions such as these; it is continually urged against plans in general, that the use of any conventional method in drawing up clinical records makes them very stiff and destitute of that natural ease which is found in a picture drawn from life. Much, however, will depend upon the kind of plan that is adopted; if it is true to nature, the fault will not be justly chargeable to the plan. Fortunately a certain degree of stiffness, and that to an extent which would be quite inadmissible in ordinary narrative, is, in clinical medicine, nothing more than terseness and vigour; and it is to be wished for, rather than not. To hit the proper mean may be difficult; but few will question, that stiffness and awkwardness of style

is a less fault, than that loose, indefinite, prosing which is so much more likely to occur.

Thus each fault has been traced, more or less directly, to the want of system in making our observations. I have shown, that conclusions are given instead of facts, from want of consideration, and that the use of a plan will ensure the consideration that is needful; that the absence of order, and the needless repetitions, are but the natural consequences of proceeding without a plan; and that, whilst omissions are in themselves of less importance than is the want of uniformity in the facts that are omitted, both are to be traced in great measure to the absence of system in the mind of the observer.

The defects point out the remedy so plainly, and the advantages of a plan are so obvious, that it is almost superfluous to disclaim any credit for originality in the suggestion. The originality consists in the discovery, first, that in framing a plan the qualities which are essential to efficiency are to be attained by a close attention to nature; and secondly, that the mechanical difficulties which prevent persons from using a plan may be entirely removed. If, in addition, the plan that I have adopted shall commend itself, it will of course be a source of gratification to me; but I would prefer to see others adopt my mode of forming a plan, rather than that they should tie themselves to the particular form which at the present time seems best to me. They should take my plan only so far as it is found to be true to nature. The time may come, when parts of the body which now seem to be as distinct from each other as the nerves are from the vessels, may be seen to be as clearly connected as are the arteries and veins; and organs, of which we are now accustomed to speak collectively, may be so much better understood as to make it absolutely necessary to separate their different symptoms. The plan that is sufficient to-day, may at a future time be worse than useless.

Many plans have been devised. For the most part, each man has his own; but neither is any one plan generally adopted by all, nor is it used by the same person for any length of time. One attempt that has been made, though so complete as to leave nothing apparently to be desired, may be taken as a type of all the rest. The London Society of Observation, by the united efforts of several, has elaborated a plan, which the lifetime of one man could not have produced; but the most ardent admirers of this monument of industry, must acknowledge, that it is unsuitable for general use. It is in that respect, like all others that have gone before—a failure. By this, however, I would not be understood to mean more than that, speaking from

my own experience, ordinary persons will be unable to use it. Two reasons may be given for this, without presumption. The habit which some have previously acquired of taking notes after their own plan, makes them indisposed to adopt another; and those who are deterred from using a plan, by the difficulties which attach themselves to even the shortest, are not likely to be attracted by one that has expanded into a small closely printed octavo. It is the length and the complexity of plans that is found so unmanageable. I shall, therefore, take special care that my plan shall be short and simple.

Nevertheless the thanks of the profession are due to the London Society for its praiseworthy attempt to introduce system into clinical study. The existence of the Society, and the issue of its work, mark an era in the history of medicine. The Society is an eloquent (though a comparatively silent) witness to the fact, that the sure foundation of medicine, as of every other science, is to be laid only on the careful observation of facts. So far am I from wishing to undervalue its work, that I indulge the hope that my present effort may be the means of making the volume to which I have referred, more generally used and appreciated. I also, with much pleasure, draw attention to certain records which appear from time to time in the public journals. Members of the London Society of Observation may be supposed to follow the guidance of their own work, in determining "what to observe." Be this as it may, the circumstance is note-worthy, that the reports which appear from the pen of some of the members, are remarkable for their cleverness, fulness, and precision; and they will bear analysis to an extent which can only be fully appreciated by those who have attempted to analyse the labours of other writers.

With this brief notice of that which comprehends, as it is in itself, a type of all that had been previously attempted, I proceed, as if no such attempts had been made; I lead my readers, step by step, over the ground which I have myself traversed in the construction of my plan; so that they may see that its comprehensiveness depends upon the way in which nature has been followed, and how that, under the same guidance and by removing difficulties one by one, simplicity has been attained.

It seems at first sight hopeless to expect that a plan can be devised, which shall be sufficiently comprehensive to include all the facts which ought to be observed, when it is remembered that these may be multiplied almost indefinitely, or, if this be thought possible, the variety of the facts seems to be so great, that we might well despair of making a plan sufficiently simple in its arrangement. These two characters, nevertheless, are

essential. Any plan that is to be really useful, must be so comprehensive as to serve for all cases, medical and surgical, acute and chronic, local and constitutional. At the same time, since "case taking" necessarily implies a certain amount of trouble, the plan must be so simple that the using of it must not add to the trouble materially, nor even at all, unless the immediate advantage is very obvious. Any semblance of inconvenience that may seem to belong particulary to the plan, must be immediately counterbalanced by something to commend it: the plan should offer obvious present advantage, as well as promise that the history itself will, by its use, be rendered more complete, and more practically useful. I believe that all this may be attained; and further, that by simple attention to the nature and requirements of the case, a plan may be devised, which, in principle at least, shall commend itself to every one who cares to use a plan at all.

The almost certainty of coming short of that which is ultimately to be hoped for, and which it is reasonable to expect will be accomplished, does not appall me. I am satisfied to hope that my effort may be the starting point for others, who shall be more sussessful. To be a finger-post on the road that leads others to success in an important work is, in itself, a sufficient stimulus to exertion, and brings its own reward.

Of the two characters, simplicity and comprehensiveness, which I have specified as essential to efficiency, simplicity is the one that it is most difficult to preserve. Every fresh case suggests additions to, and modifications of, the plan that may have already been determined on. So that unless the outline be very distinct, and unless the headings have been chosen with strict fidelity to nature, so as to be comprehensive, a hopeless confusion is the result of this accumulation of materials.

It is, however, possible to arrange the facts of every clinical record under heads which shall be both few in number and distinct from each other. There are features which are the same in every case, however common it may be, or however peculiar. The uniformity of type, so to speak, is there, though it may be hidden; simplicity will be preserved by bringing it to light. In the first place, there is a division of the facts into *past, present,* and *future,* which is inevitable. Every statement must be either history of the past, description of the present, or conjecture of the future. Again, the facts, under two at least of these primary divisions, naturally and of necessity group themselves under different heads, which are distinct from each other, but the same in all cases. For the record, whether of the past or present, is a statement of symptoms; the symptoms

are the conditions of the different organs, or of the systems of the body. These organs and systems are sufficiently distinct from each other to furnish a well-defined outline, and being the same in all cases, the outline is the same for all.

It is in the notes made at the first interview of the physician with his patient, that the divisions into past and present are most noticeable; but between one visit and another, a longer or shorter time has elapsed, during which events have transpired, which are more or less worthy of note; so that in the record of every visit, these natural divisions will exist. Moreover, there is a proper order to be observed. The report of the patient and of the attendants (the past history) forms the proper introduction to the personal observations of the physician (the present condition), whilst the prognosis, which is the conjecture as to the future, follows after all, as naturally as in the case of the other two, the one precedes the other.

In the like natural manner, the "previous history" and the "present condition" have six or eight subdivisions, according with the cutaneous, nervous, respiratory, and other systems of the body. This, therefore, is the natural basis for a plan, and shortness with simplicity is its first recommendation. But notwithstanding this, and that this general outline is so easily discovered in every case, and that the advantages of using a plan are so evident, it is in accordance with the experience of all, that in the use of a plan, practical inconveniences arise, which seem to be insuperable. Under special circumstances, *e. g.*, in the time of an epidemic, a plan may be used; but very soon it is found under ordinary circumstances to be too severe a tax upon the patience, and it is given up. The inconvenience is partly due to a mechanical difficulty, and in part, is the necessary consequence of the attempt to make the plan sufficiently comprehensive. I hope to remove the mechanical difficulty, and I believe that the second source of inconvenience may be materially diminished, without marring the character of the plan for comprehensiveness. If the present attempt be successful, it will appear that in order to introduce system into clinical medicine, it is sufficient to insist upon the merest outline, such as I have already sketched, for ordinary cases; and under special circumstances, as for epidemics and for cases which may be regarded as distinct, or which may naturally group themselves together, and which require more accurate investigation, special plans must be formed, keeping only the general outline the same for all. But whatever be the plan which is approved, the method by which it may be used with facility will be serviceable; so that it is the method of using a

a plan, not the plan itself, that I put prominently forward. Before any plan, even the most simple, can be used, the mechanical difficulty of having separate columns or spaces for the different headings must be dealt with.

It seems at first sight to be necessary that the paper, on which the notes are to be taken, should be divided into parallel columns, or by transverse lines, into as many spaces as there are headings in the plan; but as we cannot tell beforehand which space to make large and which small, the inconvenience of this constitutes an almost insuperable difficulty; hence, the more common practice is to postpone tabulation till the case is complete; then, however, the defects of the history are discovered, and, moreover, its continuity is destroyed. By a very simple device, this inconvenience may be obviated. I find that a method, similar in principle, is constantly in use among Conveyancers; mine will be better understood if I speak of it as a modification of theirs.

In making an Abstract of Title, the particulars are generally arranged under four distinct heads; and yet the writing must be unbroken. In order to this, margins of different widths are used; but always the same width of margin for the same subject. But, whilst "the law," in each subject, keeps the margins for the second and following lines, of the same width as for the first; I use the margin that is characteristic of any one subject (set of symptoms), for the first line only; and the second and following lines, in all subdivisions alike, are written across the whole page.

As a general rule, it is sufficient to have eight subdivisions; seven for the different systems—cutaneous, nervous, respiratory, circulatory, alimentary, urinary, and generative respectively, and one to spare for facts which cannot otherwise be classified. It is convenient to associate a particular number, the same in all cases, with each subdivision.

Number *one* is the number for general remarks, such as the posture in which the patient may be lying, the expression of countenance, the general impression as to his condition, which, though it is a conclusion, yet it is such an one as is often requisite to complete the picture.

Two belongs to the cutaneous system. Under this heading will oftentimes be found facts, which might, perhaps, more strictly speaking, be put under another head, *e. g.*, the flush upon the cheek, the venous hue as to the lips, might be arranged respectively as symptoms of the circulatory and respiratory systems; but inasmuch as this would involve the expression of an opinion as to the cause, and the cause assigned might subse-

quently be proved to be not the primary one; it is better as a general rule to state the facts simply as the eye sees them, rather than as the mind apprehends them.

The *third* subdivision stands for the nervous system. In this also there will be found facts, which may not be, strictly speaking, affections of the nerves. But, I remark, once for all, that provided the same symptom is always classified under the same subdivision, the exact place that is assigned to it is comparatively immaterial.

Four stands for respiratory symptoms. These are generally distinct from the rest. In no subdivision is the advantage of being able to compare symptoms, *pari passu*, with each other, more plain than in the respiratory. The facility with which, by the proposed method, the respiratory symptoms may be compared with those of the nervous, cutaneous, and circulatory systems, is all that can be desired.

Five is for the circulation. Under this heading also, may be arranged, in accordance with the theory of blood diseases, certain facts which may be characterised as "constitutional."

Six includes the alimentary symptoms, by which are to be understood those that relate to the whole alimentary canal, and to such abdominal organs as are not otherwise specially provided for.

Seven and *eight* are for the urinary and generative systems, and do not need further comment.

This natural subdivision of the symptoms has stood the test of the hurry that is incident to dispensary practice; so that it is almost superfluous to add, that it is of service in an hospital, and under circumstances where more time is at command. Yet but for the device to which I have alluded, even this simple arrangement could only have been followed in cases that were exceptional. The trouble of dividing one's paper into spaces or columns, might be incurred in studying any particular class of cases; but, for ordinary use, this would with me, as with others, have soon been thought superfluous and even disadvantageous.

My note-book, though it measures but four and a half inches across, happens to be marked with eight water lines, which run at about half an inch apart, from the top of the page to the bottom. At the top of each page, on the eight lines, the numerals 1, 2-8 are to be* placed. They refer to the different symptoms of the body, but they may represent at will, any other subdivisions. When, therefore, the fact to be noted has refer-

* It is better to place the numbers at the head of the page only so soon as the corresponding symptoms are recorded.

ence, as it must always have, to any one system in particular, the sentence is commenced on the water line, at the head of which will stand the appropriate number. The next and following lines, if any, are carried directly across the page. Thus a cutaneous symptom begins under number 2; a nervous one under number 3, and so on; and if, as may sometimes happen, there is doubt felt under which subdivision to classify any symptom—*e.g.*, whether to mention the colour of the lips as a cutaneous, or as a respiratory symptom—the sentence may be commenced under number 2 or number 4 indifferently; but the first time that the writing passes over the other line, the number should be introduced or a star (*) which, without causing any interruption, would draw attention to the fact that this system also is concerned.

When the principle is once understood, it admits of a great variety of modifications, and becomes applicable, under all circumstances whatsoever, wherein it is desirable to make a classification, without disturbing the existing order of things.

The following case of diphtheria will serve as well as any other for an illustration.

3 4 5 6

Case.—H. A., (æt. 9,) 1, Little Welbeck-street, Aug. 16, 1859.
The fourth of six children. One died of morb. cord.
One of water on the brain.

He is cheerful and remarkably intelligent; his account of himself is given with an accuracy equal to that of an adult; he says that two days ago, after smelling some cayenne, had a sensation of burning in his throat, but that on the following day, he ate his dinner as usual and not till the afternoon did he feel poorly; he then complained of sore throat and went to bed early; this therefore I consider the *first day.*

Second day— Had vertigo. He was also thirsty, and his throat was so painful that he could hardly swallow.

Fourth day—Is reported better under the application of *creasote.*

P. 120. Can swallow, with some, but not much difficulty; app. good; t. inclined to fur; thirst somewhat less; b. not o since yesterday. Rn. 28, no cough. The velum palati, and pillars of fauces, deep red, and angry looking; swollen to a somewhat greater extent on the right side, than on the left; behind the rt. pillar is seen a dirty purulent-looking mass; it may be tonsil, but I cannot continue the inspection long enough to determine this, though the patient is submissive and makes a very good throat for me; nor can I say positively that I can see the whole of the surface; it looks more like a †slough than an exudation, but from henceforth I shall call it an exudation as diphtheria is prevalent.

Fifth day.—Says he is better.

Rn. 26, feeble, I can only count it by using the stethoscope; skin cool, no cough; on asking him to breathe through his nose, the right nostril moist, the left rather dry. P. 104. Between the right st. mastoid and ramus of jaw, I can by feeling for it, find an enlarged gland, and it is rather tender; t. dirty fur over the posterior half; I obtain a better view of his throat,

† He says his "throat burst twice" yesterday, but he could not bring anything up.

2 3 4 5 6 7

by keeping the spoon on the tongue, till he retches; tonsil as before; the back of the pharynx distinctly seen, is of a dirty green colour, smooth as leather; b. o. twice; app. good.

Sixth day.—2. p.m. At eight this morning had a distressing sense of suffocation; he pointed to the top of the sternum as being the place at fault; he is now lying on his rt. side asleep, and snoring; there is a guttural gurgling, and a dry sound with it, which seems to come either from the mouth or nares, and not from so low down as the larynx; his mouth is open; has no cough.

R^{n}. 21. P. 112.

The lips are pink and slightly * livid; there is seen beneath the right nostril, but only on very close examination a pinkish stain (as from fluid which had spread there); there are some red spots upon the outside of the finger and thumb of the rt. hand, he is inclined to perspire; but the exposed parts of the skin are cool. He is rather puffy-looking about the neck and face, but I do not make out any particular swelling; when I feel of his neck, he is disturbed, turns over, but he does not thoroughly awake.

Thus far the treatment has been tonic, and stimulant; cinchona, iron and a little wine; and the topical application at first of nitrate of silver and subsequently of creasote. Antimony is now given; two gr. as an emetic, and gr. ¼ every six hours with calomel.

——— 8 p.m. asleep. Coughs a little, not in my hearing; breathes with his mouth shut; snoring is more musical, less moist.

Lividity, if any, not * perceptible by candle-light.

R^{n}. 20. P. 100 very feeble.

Seventh day.—7 a.m.

Not livid. Has had difficulty of breathing, greater than now, at times during the night; dyspnœa croupal; he is constantly shifting his position.

R^{n}. 20. P. 108. No swelling at angles of jaw, but extension of jaw gives pain; fauces as far as seen look angry red; the top of the slough on the right side, seen with difficulty.

—2 p.m. No redness under nostril, none on finger, nor sign of any; lips rather pale, and rather * dusky, but not enough so to be noticed if the breathing were not croupal; exp^{n}. is rather longer than insp^{n}. he points to top of sternum for pain. R^{n}. 20. P. 108. Stools green.

U. normal colour sp. gr. 1031; on add^{n}. of NO_5 and boiling, turns inky; on add^{n}. of KO, a cloud which is not dispersed on boiling, but disappears on add^{n}. of acid.

—9 p.m. Pale; cool; but he is only covered with a sheet.

Restless. R^{n}. 18. P. 136. Fauces, angry-looking with exudation on both sides; looks like a bad ulcerated sore-throat.

Gives a short cough after every two or three inspirations.

A consultation is held, and it is decided not to perform tracheotomy, but the antimony is to be discontinued.

Eighth day.—8 a.m. Looks lively; says he is better. I now feel glad that tracheotomy was not performed; last night I would have had it done at all hazards. R^{n}. 20. or thereabouts; noisy enough to count: sibilant; both insp^{n}. and exp^{n}. with distinct effort; cough dry, but succeeds in raising some muco-purulent clots. P. 112. No swelling at jaw.

No lividity worth notice.

—— 2 p.m. A change! R^{n}. 32. P. 108 failing.

His face is livid and * there is livid pallor of limbs, with coldness; he sits fixedly in bed, afraid to move, with eyelids closed; or lies with his head and limbs outstretched; unwilling in either case to stir till obliged, as if reserving his little remaining strength in order to get breath; gives at intervals an ineffective cough, or suffocative screech.

The change took place two * hours ago; he then could speak, but was tossing about, and as if there were a string round his neck.

4

Necrosis 22*h. after death.*

There is redness of the trachæa, and a little membrane in the upper part; it is closely adherent to the ventricles of the larynx, and loose below; at the time that I saw it, after it had been floating a few minutes in water, it had lost its consistence, I was surprised to see so little.

There is some appearance of membrane lining the left nostril, I should not have noticed it, had I not looked carefully for it.

There was a quantity of muco-purulent secretion in the bronchi.

On comparison of the above case with the plan that is afterwards given some omissions will be discovered; had I now the opportunity these would of course be avoided. The case may, however, be taken as a sample of the way in which the general plan may be applied to any case that may present itself, and with this illustration before him, the reader will perceive the following obvious advantages of such a mode of observation.

The numerals at the head of the page, or the spaces that remain unoccupied, continually remind the observer that the record for any one day is incomplete until the organ which that number represents has been passed in review. This is at the time a great assistance, and for the future it is an assurance that any new symptom, which may arise, is not merely something that has existed before, and which was previously overlooked, but that it is, as it seems to be, a new symptom. Again, at the time of attendance the condition of each organ may be readily compared with that of the same organ previously, and thereby each observation acquires additional value; and subsequently, when the case is complete, it is all ready tabulated, without any re-arrangement of the facts, and without disturbing the proper sequence of events; so that the course of any one set of symptoms, either by itself, or *pari passu* with other symptoms, may be traced continuously through the whole. Finally, in after time, when search is made after any particular, which subsequent reading or experience has shown to be of significance; a single glance at the numbers at the head of the page, will tell whether a given case is likely to contain it; and if so, the eye is at once, and without fail, directed to the place where it may be found.

I now proceed to show how that, by taking the general plan for a basis, *special* plans may be formed. I take diphtheria as an opportune illustration of a method which I adopted at the time of the cholera in 1854, and which I have, therefore, since then had opportunity of testing. I cannot too strongly recommend this mode of study, previous to and concurrently with original clinical observation. Under the circumstances

just alluded to, it gave me a degree of confidence, which I should not otherwise have had; it enabled me from the first to turn my own experience to greater account; and it gave a definite aim to acts, which otherwise would necessarily have been more purely tentative and empirical. I venture, moreover, to promise the young student in medicine that such a course of procedure will help him to acquire a habit of accuracy; and his studies in proportion as they are less discursive, will be both more interesting and instructive.

Until we have a special plan for the particular case that we wish to study, the general one must serve. Circumstances more or less accidental, must at first guide us in the selection of the symptoms under each heading. Succeeding cases of the same disease will present some at least of the same symptoms, and, it may be, others in addition. In no long time, by collation of these symptoms we obtain what may be called a typical case, and this is the special plan that we require. We follow, but in a systematic manner, the mental process which in reality takes place in the mind of every careful student, and constitutes that which we call our experience of a given disease. Being performed designedly, the result is both more perfect in itself, and is arrived at more speedily; considerations, both of them, of practical importance sufficient to compensate for the trouble, even if it were much greater than it is. The trouble is, however, as we have shown, much diminished by using the general plan and by adopting the device which has already been explained.

I would gladly acknowledge the sources to which I am indebted for the construction of the plan which follows; but this is impossible. It is my constant practice to analyse, by writing out afresh, every clinical record that I meet with, and which bears upon the subject which I may be studying. The pages of the "Medical Times," of the "Lancet," and of the "Association Journal," with those of the different reviews of the last two years, supplied me in the first place with facts, and more than all, the monographs in the volume issued by the New Sydenham Society. The wards of St. George's Hospital and a few other cases in my own neighbourhood have given me the opportunity of digesting and assimilating these facts to a certain extent; and the form that I have adopted enables me to embody my own limited experience, without speaking dogmatically as to the nature of the disease, or as to the most successful mode of treatment.

TYPICAL CASE OF DIPHTHERIA.

2 3 4 5 6 7

A. Previous History.

a. General, i.e., circumstances which relate to others besides the patient.

i. Epidemic: evidence in proof, or to the contrary; age[1] of it.

ii. Contagion: chances to which others[2] have been exposed.

iii. Concurrence of other diseases.

(1.) Among men, scarlet fever,[3] sore-throat, croup,[4] measles.[5]

(2.) Among other animals.[6]

iv. Season of the year; local hygienic influences.

v. Hereditary[7] influence.

β. Special,[8] *i.e.,* Circumstances which relate to the patient only.

i. Length of exposure to epidemic influence.

ii. Supposed source of contagion, date of exposure to it.

iii. Existence of other disease prior to present attack.

iv. Hygienic[9] influences.

v. First symptom observed, date[10] of it; all future[11] dates to be from this.

B. Present Condition.

Aspect: general condition,[12] debility,[13] vigilantia,[14] expression of countenance, posture, previous treatment,[15] the effect of it, immediate or subsequent.

Skin: general hue,[16] rash,[17] desquamation, bullæ,[18] diphtheretic[19] affections. Nervous[20] affections, intellect,[21] motion,[22] sensation, special senses. Respiration: frequency,[23] character, fœtor,[24] snuffling[25] (nostril), voice[26] (larynx), cough,[27] expectoration (bronchi).[28]

Pulse:[29] frequency, force, regularity, effect of posture;[30] tendency of blood to coagulate.[31] External swelling[32] and tenderness, thirst, appetite,[33] deglutition,[34] state of bowels,[35] gums,[36] buccal membrane, tongue,[37] fauces,[38] tonsils, colour and condition of surrounding parts, and of subjacent tissue, exudation,[39] age[40] of it; (*a.*) in situ; (*b.*) after removal, as seen by naked eye; as seen under the microscope; the tissues involved; the mode of increase,[41] of departure.[42] Albumen,[43] casts, urea.[44]

C. Conclusion. Recovery or death.

Date of recovery: from time of seizure, from time of commencing treatment, from time of relapse.

Do. do. of death: post-mortem appearances.[45]

Remarks.

1. The character of an epidemic varies so much in its progress, that it should always be stated how long it has been prevalent.
2. Members of the same family, or of the same household but not of the same parents (*e. g.*, children in a school, patients in an hospital, casual visitors), give valuable evidence bearing upon contagion.
3. The dispute whether a case is one of sc. fever, or sore throat, or diphtheria, is endless. If the facts are given, the opinion will be superfluous. The prevailing type, the rash[17], the affection of the throat, the condition of the urine, are the principal points, and may be given in few words. In each case it should be stated how soon the abnormal condition was observed.

4. State whether* the fauces were examined, and when; or whether it was *tacitly assumed* that the larynx was primarily affected. On visiting a district in Lincolnshire, where I had been informed that there had been many cases of diphtheria, and but very few, if any, fatal ones. One of the most intelligent medical men of the neighbourhood kindly let me see a list that he had preserved of all the cases, both of diphtheria and of other diseases, which had come under his notice during the preceding months. He had not lost a single case of diphtheria; but his record showed three or four concurrent cases of croup, which had proved rapidly fatal. Post-mortem examinations are "never made in that country," so that, in the absence of evidence to the contrary, I could not but suspect that some at least of the cases of croup were really fatal cases of diphtheria, and, therefore, that the success of the treatment had not been so uniform as was supposed.
5. A careful examination of the expectoration† in pulmonary affections should be instituted.
6. A farm servant, of much experience, and of more than ordinary intelligence, who lived in the district to which I have just referred, as one affected with diphtheria, told me that there had been at the same time and previously great mortality among sheep, pigs, and cows; and sickness among horses, but not more deaths among them than usual. Sheep and cows had been unusually liable to fatal inflammation of the lungs with effusion. Pigs and cows had died unable to swallow; he had seen a membrane on the tongue, and regarded its extension to the throat as the immediate cause of death. In some cases the hoofs of the feet and sometimes the hair of the trunk fell off. Horses also had been affected with sore throat; this he called influenza, and said that it was generally cured by blistering.
7. Cases have been noted in the same family, not only concurrently, but in different epidemics, and under different (?) local influences.
8. In the plan the *general* and *special* circumstances are separated, because it is important to remember that many facts must be viewed "generally" before their "special" relation can be rightly estimated. But in the narrative such a separation involves a repetition which would, for the most part, be unnecessary.

* See case of croup by Dr. Barker, Trans. Path. Soc. vol. x, p. 69.

† See 27, 28.

9. The hygienic influences should be noted, at the first visit, in respect of the favourable or other condition in which the patient has been placed; and also afterwards, occasionally, with reference to the treatment. Bretonneau attributed the serious effects of his heroic doses of mercury in part at least to excessive cold.
10. It is not always possible to fix the date of commencement; but whenever it is so the day and hour should be given.
11. All future dates should be stated as second, third, fourth, &c., day; each day being twenty-four hours complete, reckoned from the time of seizure.
12. A single remark at the commencement as to the general condition, though it be matter of opinion not of fact, is admissible, and it makes the reader better able to realise what follows. The authority for the statement should be shown by the introductory expression "He seems," or "Nurse thinks him," or "He says," the words of the patient being marked by inverted commas.
13. The prostration is generally out of all proportion greater than is to be accounted for either from the length of time during which the patient has been ill, or from the other symptoms. This is more remarkable in elder than in younger patients. It is, however, even more important to bear it in mind in the case of children; for in them the fatal termination is often most sudden and unexpected.* The child is thought to be going on well; is sitting up in bed playing with its toys; or it is taken up to stool: it gives warning scarcely sufficient to attract notice, and—it is dead! This occurs, sadly enough, more particularly among those who are convalescent.†
14. The wakefulness of patients, and at times a peculiar restlessness is the one fact which forbids a favourable prognosis when all else promises well.
15. In the MSS. it will be found convenient if *the treatment* is underlined; so that at any time it may at a glance be seen, both what it is, and what changes, if any, have been made in it.

    The treatment may conveniently be summed up as I. Nutritive, and II. Medicinal. Nutrition in small quantities and frequently is of the first importance. Enemata should be given when from dysphagia or other cause food sufficient cannot be swallowed. Milk, or milk and water with cream, beef tea and wine, are generally taken without difficulty, and should be given at regular intervals.‡ The necessity for stimulants is so obvious, and they are for the

* See 30. † See 31. ‡ See 33, 34.

most part taken so willingly, that there is not much danger of forgetting the wine; but there is a fear sometimes lest the nurse should think that wine alone is sufficient nourishment. General depletion is not likely to be adopted; local depletion, as when there is great swelling of the glands of the neck, is not of the same temporary advantage as in scarlet fever. Mercury has few advocates. In Bretonneau's cases the advantage seems, as he himself at times suspected that it was, due to the topical influence on the exudation. The tincture of iron with quinine is most generally approved. Senega as an emetic and as an expectorant is strongly recommended when the disease has extended to the air passages, and the cough has begun to be moist.* The presumed increased liability of the blood to coagulate suggests the exhibition of ammonia; the sesquicarbonate as an energetic and diffusible stimulant might, therefore, be conveniently added. Where fatal syncope is feared the prone position should be insisted on.

The local treatment: Blisters, not continued beyond the commencement of vesication; not even till the epidermis begins to be elevated; it is sufficient for the surface of the skin to be slightly wrinkled. *α*. Hydrochloric acid (*strong*, the object being to destroy); unless the exudation extend out of sight, when the acid must of course be diluted; the application itself will produce swelling, so that the effect, whether beneficial or otherwise, cannot be determined till twenty-four hours have elapsed. *β*. Mercury. After tracheotomy had been performed, Bretonneau applied mercury to the inside of the trachœa and bronchi by insufflation, and apparently with benefit. Alum is recommended, and the injection of salt and water *per nares*.† Solid lunar caustic is the most common local application. Bretonneau used it in preference to hydrochloric acid, as being less painful and more efficacious; the only objection to it is that after a surface has been touched it is immediately whitened, and it is difficult, almost impossible, to say which is the effect of the remedy and which of the disease. This, however, is practically of little moment. The monograph of Britonneau is particularly worthy of study on account of the impartial evidence which it contains on the question of tracheotomy. Cases of all kinds are related; the operation is most carefully described in all its stages; and though many cases were fatal, yet others recovered from a

* See 27. † M. Roche, Lancet, Aug. 20, 1859.

hopeless condition, so that it seems to me impossible to justify the practice which would allow any person to die without attempting this last resource even if it should only be in our power to perform it on a patient who is *in extremis*. The most important practical point in connection with the treatment of the patient after the operation is that care should be taken to use as large a tube as possible, and to keep it free from mucus or other impediments to a free passage of air. Even a double canula is something short of that which might be devised. Some adaptation of a spring is that which naturally suggests itself as being the best mode of keeping the artificial opening free, without narrowing the diameter of the trachæa, as must occur when even one tube is introduced. The form of tube which is imperfect on two sides, which, therefore, admits of more easy introduction than an incompressible cylinder, and which, when introduced, allows some air to pass by way of the larynx, so far as that is possible, is the nearest approximation that I have seen to that which seems to be wanted. When after death, we find a surprisingly small* quantity of membrane in the trachæa, or even in the larynx, the hope, that the persevering application to the throat of a sponge (Graves) wrung out in water, as hot as the hand can bear it, would in some cases be of service, seems to be rational. I have seen great temporary relief follow, even when the impediment to the breathing was some enlarged glands at the division of the bronchi.

16. The general hue of the skin, and particularly of the lips, is a very valuable monitor of mischief in the lungs, or rather of the degree of impediment that there is to the entrance of air into them. Petechiæ† have been found in some cases throughout the body.
17. The rash may be rapidly evanescent, so that it is safer to say "no rash seen," than absolutely that there was none.
18. Diphtheritic exudation has been noticed within bullæ, before the skin was broken, also beneath a blister before the cuticle has been removed.
19. To be looked for on any abraded surface, on wounds, on the conjunctivæ also.‡
20. The mental powers are commonly in full vigour to the time of death; even children do not die in convulsion.§

* See 45. † Pathol. Trans. x, 327.

‡ Mackenzie, Brit. Med. Journ. 1858, p. 53.

§ In a large proportion of cases convulsions in the infant answer to delirium n the adult. West, on Dis. of Child.

21. The affection of children is often unusually striking, and the intellectual faculties seem, in many cases, to be stronger than before the illness.
22. It is during convalescence that paralysis of the muscles of the palate, and of the voluntary muscles of the whole body is apt to occur.* More rarely the sight (Dixon) and hearing have been impaired. Recovery from these conditions may be confidently expected; though the improvement is usually tedious.
23. The number of respirations per minute should be carefully watched. Though all the symptoms promise well, save only that the breathing remains quick, it will be very hazardous to give a favourable prognosis. The character of the breathing is not always constant. It may be tolerably free at the time of the doctor's visit, whereas on inquiry we find that at times the patient has urgent dyspnœa.
24. Fœtor of the breath may be solely from decomposition of exudation that is in course of separation from the nostrils and fauces; and may sometimes be removed by chlorinated injection into the nostrils.
25. Bretonneau lays great stress upon this symptom, because it is so important that the disease should be recognized as soon as possible. He thinks that the disease not only spreads from the throat to the larynx, but from the nostrils to the throat;† and that if discovered in the nostril it may be stopped before the throat has become affected. He says, that the distinctive features of this affection of the nostril are that it attacks only one of them at first; and that the secretion excoriates the lip below that nostril, whereas in ordinary coryza both nostrils are affected. If the patient close his mouth and stop first one nostril then the other with his finger while he breathes, the condition of the open nostril is at once declared by the sound of the air as it passes through it. Some persons have ridiculed the remarks of Bretonneau as being too fanciful. There may be less in them than he supposes; but I am inclined to think that the subject has been dismissed too hastily by the critics, for I know how very easy it is to overlook such a condition of the nostril, so that I should place little reliance on the assertions of any who had not made a point of looking, and assuring themselves that the nostril is as free as they may think it is on a cursory examination.

* A very instructive case by Ransome, is to be found, Brit. Med. Journal 1859, p. 906.

† See 41.

26. The change in the tone of voice is one of the earliest indications that is given of the extension of the disease to the larynx. It may sometimes be perceived if the patient is instructed to speak loud, when the ordinary tone of voice reveals nothing amiss. In the same way a peculiar kind of snore may be heard during deep sleep (when the breathing is naturally louder), whereas while the patient is awake all seems as it should be. The nurse, therefore, and attendants should be closely questioned, and instructed to report any such change that they may observe.
27. It is a favourable sign when the cough having been dry, becomes moist. The expectoration though it may seem to be entirely of mucus, or of pus mixed with it, when well washed by being beaten up with water, may show pieces of separated membrane. These, if present, will settle to the bottom of the vessel.
28. When the larynx is involved, the bronchi are so liable to become affected that the danger is, perhaps, greater lest it should be assumed too hastily that they are so, than that such a condition should be overlooked. I have seen the *assumption* that there is disease of the lung turn the scale against the operation of tracheotomy, though it was the only resource that suggested itself; and after death all but the larynx was found free from exudation, and, as far as I am able to judge, there would have been a reasonable prospect of success. One such instance is to my mind an unanswerable argument in favour of tracheotomy, even if the mortality were greater than it is.
29. There may be no febrile disturbance, but only a very feeble pulse; if the pulse is frequent, it is very rarely full. When there is any fever, it does not bear any marked relation to the condition of the throat.
30. It is seldom necessary, and in some cases it is obviously undesirable,* to make the patient sit up for the purpose of observing the variation in the pulse, which is due to a change of posture. But if the patient sit up for any other purpose the effect is noteworthy as an indication of the extent of the debility that there is.
31. The similarity in the mode of death in some cases of diphtheria to that† where clots have been found in the pulmonary artery suggests a point for further investigation.
32. The enlargement of the glands at the angle of the jaw,

* See 13.

† Humphry on the Coagulation of the Blood, pp. 23-31. 1859.

sometimes with pain in the ear, and with more or less tenderness of the glands themselves, is one of the earliest symptoms, and it remains almost longer than any other. The swelling is often so considerable as to be seen by the most superficial observer; but it may be so slight as to escape observation unless the parts below the ear and under cover of the body of the jaw are handled. When one side only of the throat is affected it is generally the same side on which the glands are enlarged.

33. Even when there is no marked difficulty of swallowing, the listlessness and indifference of the patient is apt to leave an impression that there is some special disinclination to take food, whereas it is only a general reluctance to make any exertion whatsoever.

34. The throat may be extensively affected, and yet no difficulty of swallowing experienced by the patient.

35. The bowels are generally costive.

36. The condition of the gums is very liable to be overlooked, people for the most part do not show their gums when they put out their tongue. The inside of the cheek is still less likely to be seen, unless it be specially examined.

About six months ago I noted for the first time an appearance, as of flour, on the gums of a person who was at least suspected to have diphtheria. It was considered at the time to be one of the characteristic symptoms of the case. Since then, however, I have observed a similar appearance on the gums of patients who were regarded to be suffering from other diseases, so that either it is not characteristic of diphtheria, or this is a diphtheritic character which has been engrafted on other diseases. Under the microscope the powder is seen to consist of epithelial scales.

37. The tongue is generally clean.

38. In examining the throat it is often very difficult to determine whether there is ulceration or not, and also whether there is exudation or not. The mark that remains after the application of nitrate of silver is very like a patch of exudation; and on the other hand a patch of exudation in the tonsil, especially if the surrounding parts be œdematous, looks exactly like an ulcer. The illusion is perfected if, in addition, the exudation is in shreds, partly decomposed, exhaling fœtor, and if the crypts of the mucous follicles are filled with exudation which looks like pus. The condition of the parts after death, or after recovery, will in some cases with difficulty convince a man that his

eyes deceived him when he spoke of "extensive gangrenous ulceration."

39. The term exudation is convenient, whether it be an exudation or not, provided that the description is given of what is meant by the term.
40. The region from which the exudation was removed should be named, and whether it is of that which has existed some time, or which has been formed quite recently.
41. It is of great practical importance to bear in mind that of the surface affected the progress is from above downward;* and also that in severe cases it is out of all comparison more rapid in the first twenty-four hours, than afterwards.
42. By separation of the membrane—by disintegration—by attrition.
43. Albumen is not invariably found. When present it may be detected much earlier in the disease than is commonly the case in scarlet fever.
44. Dr. Sanderson found the quantity of urea increased.
45. Attention will primarily be directed to the seat of the exudation as observed during life, and to its extension into the air passages, and more seldom into the œsophagus. The condition of the lungs and of the kidneys should also receive special notice. The disproportion that may be found between the morbid alterations and the fatal result is in accordance with that which obtains in other diseases which run a rapid course (Bretonneau).

CASES OF TREPHINING IN SYPHILITIC DISEASE OF THE BONES OF THE SKULL, WITH OBSERVATIONS.

By Henry Lee, F.R.C.S.,

Surgeon to King's College Hospital, and Senior Surgeon to the Lock Hospital.

PLATES IV. and V.†

Case 1.—Mary B., æt. 24, was admitted into the Lock Hospital, on the 23rd of February, 1860; she stated that six years previously she had contracted syphilis, which was followed by an eruption over the whole body. The eruption recurred, and after the lapse of three years appeared, from her description, to have resembled rupia. Eighteen months before her admission, she had a "very bad ulcerated sore throat." This had only recently healed.

Six months ago, she first noticed a painful swelling on the forehead, which increased to about the size of an egg, became soft, and gave way spontaneously, exposing the bone.

Upon her admission, she was extremely weak, much emaciated, and quite

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* See 25.

† The coloured plates illustrating Mr. Lee's paper will be published in Part VII.

unable to walk without assistance, the want of power being principally in the right leg. A piece of the frontal bone, about three inches in diameter, was exposed, dry, and dead. There were several nodes on different parts of the head, one of which had suppurated and burst over the right parietal bone, and another over the anterior extremity of the sagittal suture; an extensive unhealthy looking ulcer existed under the chin and on the left side of the neck. This had completely detached the lobe of the ear from the side of the cheek (Plate IV). The patient was unable to hear anything said in an ordinary tone, but could understand when spoken to very loudly; she seemed to have almost entirely lost the sense of smell. Sensibility on the right side of the face, including the right half of the upper lip, was impaired in a marked degree; but there was occasionally tingling pain and, involuntarily, twitching of the muscles upon that side.

She was ordered a pint of the decoction of sarsaparilla daily, and had no other medical treatment.

February 29.—Has complained for the last few days of pain over both clavicles, and last night a node over the right one gave way, leaving the bone exposed.

March 5.—Has now sufficient strength to walk about the ward without help; she still, however, appears weaker on the right leg than on the left. The ulceration on the neck is spreading.

Operation, March 8th.—A crown of a large trephine was applied near the centre of the exposed frontal bone, to the left of the median line, and the entire thickness of the bone removed. The exposed dura-mater bled from a few points, but presented elsewhere an opaque white surface, which did not bleed. The internal table of the removed portion of bone was very vascular and soft. The surface which had been in contact with the dura-mater was roughened in a very peculiar manner, presenting numerous elevations and spiculæ of bone, and having the appearance of having been extensively worm-eaten. The accompanying drawing (see Plate IV), by Dr. Westmacott, taken two or three days after the operation, shows very accurately the condition of the internal table of this portion of the bone, and the appearance of the part from which it was removed. The middle and external table had entirely lost their vitality.

March 10.—Yesterday morning, and again this morning, on waking, she had strabismus of the right eye, which lasted for two or three hours, and then disappeared.

March 14.—The strabismus has returned every morning since the last report, but this morning it was not seen.

March 20.—No return of the strabismus. Granulations have formed upon the dura mater. She complains of much pain about the ulcers on the neck. The hearing is decidedly improved.

March 21.—Feels much better in every respect. The sensibility of the right cheek has returned. Very slight pain in the neck.

March 27.—She can now hear perfectly when spoken to in an ordinary tone; is gaining flesh rapidly.

April 5.—Is free from pain, and able to go down stairs and walk in the garden.

May 1.—The ulceration on the neck is quite healed. She now hears quite well. There is still some numbness on the right side of the upper lip. With this exception sensation is perfect.

There was no return of the muscular twitchings, nor of the insensibility

during the months of May and June; slight numbness of one half of the upper lip, still however, remained.

Case 2.—Mr. ————, a tradesman in the city, came under my observation on the 3rd of March, 1859. He gave no distinct history of any primary syphilitic affection, but a well-marked and accurately-defined induration existed at the upper part of the root of the penis.

Eight years previously, an ulcer made its appearance on the forehead, immediately over the left eye. This spread rapidly in every direction; about the same time the skin over the right elbow began to ulcerate. This ulceration extended upwards and downwards, and involved the skin of the whole arm. The ulceration on the forehead healed, but that on the arm had never entirely done so. Three years after the commencement of this ulceration, he had a severe convulsive fit; he was not insensible, but there was violent contraction of the muscles of the jaw and back. During the continuance of the spasm no food could be administered. The muscles of the face were likewise affected.

In the year 1857, it became evident that the bones of the skull were extremely diseased. He was now one day suddenly seized with violent spasmodic contractions of the right side of the face, which lasted half-an-hour, without loss of consciousness. Four months later, a second attack followed of a more severe character. This lasted six hours and a half, was accompanied by partial paralysis of the right side of the body, and tremor of the limbs. Subsequently to this, several milder attacks occurred, and increased in frequency. He always had a warning of these attacks. His face became flushed, there was a difficulty of articulation, and tremor of the muscles on the right side of the face.

This patient underwent a great variety of treatment by different medical men, and was, for a considerable period, out-patient at St. Bartholomew's Hospital. On the 13th of September, 1859, he was admitted into the Lock Hospital; an ulcer still at that time existed on the outer side of the right forearm. The cicatrized skin from the shoulder to the wrist, firmly bound down the parts beneath, and the arm was, in consequence, very much reduced in size. There was no motion either in the elbow or wrist joints. The hand was greatly swollen and œdematous. The frontal and parietal bones were in several places denuded. Extensive portions of their outer tables were either carious or necrosed.

Operation.—All ordinary remedies having been previously exhausted, this patient was placed under the influence of chloroform, on the 25th of October, and the trephine applied in several places over the right parietal bone. In the part apparently the most diseased, the whole thickness of the skull was removed, to the extent of one crown of the trephine. In other places, the outer and middle tables only were taken away. The exposed dura-mater, where the whole thickness of the skull had been removed, bled freely, and did not appear to be covered by any deposit. The surface of bone which lay in contact with it, was slightly eroded, but not nearly to the same extent as in the previously recorded case. It was also perforated by numerous very minute holes.*

October 26.—Had slept well during the night.

November 5.—Had two fits last night similar to those he had had previous to the operation. They were reported by the house surgeon as "of and epileptic character, accompanied by loss of voluntary power."

* The portion of bone which was at first carefully preserved, was, subsequently, accidentally lost.

November 12.—General health improved. Healthy granulations from the scalp. The ulcer on the arm showed a disposition to heal.

November 27.—Had a slight fit which lasted about a quarter of an hour. During this time he was quite conscious, but the lower jaw was fixed, and the muscles of the face were slightly convulsed. From this time until he left the hospital, on the 23rd of December, there was no recurrence of the fits. The wounds in the scalp assumed a healthy aspect, although there were still some small portions of bone which remained uncovered. The wound in the arm became reduced to the size of a fourpenny piece, and he had evidently gained much in health and strength.*

Case 3.—A farmer, æt. 42, with a remarkably well-developed frame, was admitted into the Lock Hospital on the 2nd of October, 1858, and died on the 12th of November following.

For six years this patient had suffered from severe pain in different parts of his head, and extensive ulcerations, especially upon the right leg. The left eye and left nostril had been destroyed by ulceration.

Extensive portions of bone had exfoliated at different times, principally from the right side of the upper part of the skull. The original seat of pain corresponded to the upper part of the occipital bone; on the 4th of November this patient became paralytic on the whole of the left side. He was slightly delirious and subsequently comatose.

On the 11th of November, a trephine was applied near the anterior and inferior angle of the right parietal bone, but nothing was met with to account for the symptoms.

On a *post-mortem examination* the whole of the organs were found in a remarkably healthy and well-developed state, with the exception of the brain and its coverings, and the remains of the ulcerations above mentioned.

The outer table of the skull had disappeared over a large part of its surface.

The diploe throughout was filled with bony deposit, and was of the same consistence as the other tables. Extensive portions of the frontal and both parietal bones were deficient in their entire thickness. The upper part of the occipital bone, corresponding to the original seat of pain, was carious. A circumscribed portion of the inner table of the right parietal bone was apparently necrosed, but the outer table in this situation retained its vitality. (See Plate V.) One of the portions of bone

* This patient continued to show himself at the hospital occasionally, until midsummer following. The ulceration on the arm entirely healed, having been open between eight and nine years. The exposed scalp became covered, with the exception of a few very minute portions of bone. He had two or three slight attacks of the twitching of the muscles of the face, but no recurrence of the fits; with the above exceptions, his health appeared to be permanently re-established.

removed by the trephine was within a quarter of an inch of this portion of necrosed bone.

Corresponding with these diseased portions of bone, the dura mater was covered by a tenacious brown semi-fluid material. The adjacent surfaces of the arachnoid were glued together by a similar effusion. The brain had, in different parts, undergone various stages of red softening, which it will not be necessary here further to detail. It was presented, while in a recent state, to the Pathological Society; and a description of the appearances, together with a plate by Dr. Westmacott, are published in the 10th Volume of that Society's Transactions. It is important however to remark that the disease of the brain was most advanced in those parts which corresponded to the disease in the bone, and that immediately opposite the affected portion of the occipital bone on the left side of the median line, where the pain had commenced six years previously, the brain substance was softened down to the consistence of cream. There was no disease of the brain or its membranes in those situations where the entire thickness of the skull had been removed.

Observations.

In cases of syphilitic caries and necrosis of the bones of the skull, the outer and middle tables are alone generally diseased; or, if the internal table is affected, it is to a small extent only, and in places where the outer table has already perished.

One reason of this may doubtless be found in the fact that the internal table of the skull has an independent supply of blood from the vessels of the dura-mater, and its vitality may be preserved quite independent of the external table. For the same reason, the internal table of the skull may become the seat of a disease which does not affect the outer table, and may be necrosed, as in Case No. III, or carious, as in Cases No. I and II, without the external table being similarly affected. In such cases, the disease of the bone occasionally leads to the effusion of serum, lymph, or pus on the surface of the dura mater; and the secretion thus produced, together with the diseased portion of the internal table, becomes confined by the outer tables of the skull which may remain in a comparatively healthy state. In Case No. III the disease commencing in the bone, extended by continuity of action first to the membranes of the brain and then to the brain itself, and produced no disease (except such as may have resulted from morbid nervous influences) in any other part. In the other two cases the con-

dition produced by the disease of the bone was not confined to its immediate neighbourhood. In the first case it seems to have extended from the dura-mater lining the frontal bone to the base of the skull, and then to have affected the seventh pair of nerves, and the second division of the fifth nerve upon the right side.

In the treatment of cases where the internal table of the skull has become involved, the removal of the carious, or necrosed, portions affords the best, if not the only, means of preventing the progress of the disease.

This is often accomplished by nature: but here, as elsewhere, artificial means may be used when the powers of nature are not sufficient to accomplish the intended object.

In illustration of this subject, it must be remarked, that in those places, in Case No. III, where the entire thickness of the skull had been removed, there was no disease either of brain or of its membranes; but that in those situations where the diseased bone had been maintained in contact with the dura-mater, effusion on the surface of the membranes, and softening of the corresponding portions of the brain had occurred.

It can rarely happen in these cases that the whole of the diseased internal table of the skull can be removed artificially; but it appears from cases No. I and II that the removal of even a comparatively small portion of the internal table has a very marked effect in relieving the irritation of the membranes of the brain. This may depend firstly and principally upon the facility that is thereby afforded for the free discharge of any fluid secretion through the opening in the bone, and, secondly, upon the establishment, from one part of the dura mater, of a healthy suppuration.

One of the most prominent symptoms, and one which gave the greatest inconvenience to the patients in the above-related cases, was the recurring, persistent, and extensive alterations of portions of the skin. These ulcerations were upon the side upon which the bones of the skull were principally diseased. If they depend, as I shall endeavour to show they do, upon deranged nervous influences, then it appears that such nervous actions, in their transmission from the brain, follow a law different from that which obtains with regard to ordinary sensation and voluntary motion. The same, and not the opposite side of the body, is affected to that on which the irritation, or the paralysing influence, is applied. To this rule, a rather remarkable apparent exception presents itself in the third of the above-mentioned cases. The left eye was lost, and the nostril was closed, in consequence of ulceration; and yet the greater part of the

diseased bone was upon the right side of the head. But this exception is apparent only. The affection of the eye and nose occurred in a comparatively early period of the case; and at that time the pain at the back of the head was one of the most prominent symptoms; and here it was that ultimately a portion of the *left* posterior lobe of the cerebrum became softened down to the consistence of cream.

Dr. Brown Sèquard* has shown, experimentally, in how great a degree the supply of blood depends upon the nervous influence in a part. If this nervous supply be cut off, the vessels dilate, the parts become warmer than natural, and the processes of nutrition are necessarily affected. These results appear on the same side of the body upon which the nervous lesion has been produced. If diminution of nervous influence is followed by an increased flow of blood through the vessels of a part, it is more than probable that an increase of nervous action or irritation would be accompanied by some corresponding change.

Dr. Brown-Sèquard has also shown how readily epileptic fits may be produced when certain nervous influences have been mechanically interfered with. In case No. II the convulsive attacks bore some resemblance to those produced artificially in some of the Brown-Sèquard's experiments. The flushed cheek indicated the dilated condition of the vessels, and the fits which followed this peculiar warning were somewhat similar in kind to those occasioned by artificial means.

Early in the present century Majendie showed, in his experiments on the branches of the fifth nerve, that the abstraction of nervous influence was liable to be followed by ulceration of the cornea. The same fact may be proved by clinical observation.†

* See Dr. Brown-Sèquard. Lectures delivered before the College of Surgeons. Lancet, Lect. X and XI, Nov. 1858.

† Richard Hill, 51 years of age, became an inmate of St. George's Hospital on the 1st of September, 1841, having about 7 weeks previously received a severe blow from a heavy piece of timber upon the left side of his head. He was rendered perfectly insensible by the accident, and lost a considerable quantity of blood from the ears, nose, and mouth. On the following day, when he regained his senses, it was found that the right side of his body was completely paralyzed, and that there was ptosis of the left eyelid. On his admission into the Hospital, he complained of much pain in the head, and especially on the left side. The ptosis continued, and there was a discharge of pus from the left ear. He had recovered from the paralysis of the right side, but was still extremely weak, especially in his lower extremities. The left eye was turned inwards, and the pupil much contracted. He had lost all sensation in the left side of the face and upper part of the head. He could neither taste nor feel upon the left side of the tongue, except at its root, nor was he at all conscious of any sensation when a probe was introduced into the left nostril. The same want of sensibility might be observed in every part to which the branches of the fifth nerve are distributed.

If it be then admitted that certain disturbing nervous influences will alter the supply of blood to parts of the body, and if it be further shown by direct experiment and observation that alteration of structure and ulceration may be produced thereby; then can there be no difficulty in admitting that the extensive and persistent ulcerations observed in all the above-mentioned cases may have depended in a great measure, if not entirely, upon morbid nervous influences resulting from disease in the bones of the skull. These observations, taken in conjunction with the results of Majendie's experiments, apply with peculiar force to the destructive ulceration which affected the left eye and left nostril in the third above-recorded case.

CASES ILLUSTRATING THE FORMATION OF SO-CALLED "FALSE MEMBRANES," IN CONNECTION WITH THE IMMEDIATE COVERINGS OF THE BRAIN; WITH OBSERVATIONS.

By John W. Ogle, M.D., Oxon,

Assistant Physician to St. George's Hospital; Honorary Secretary to the Pathological Society.

Continued from page 284, *Vol. I.*

PLATE VI.

Case 7.—"*False Membrane*" *attached to the inner surface of the Dura-Mater, from a case of Phthisis.*

The case was that of a man, C. N., aged 21, who died in St. George's Hospital, 1858.

Previous History.—The patient had been living miserably some time in Paris as a metal-chaser. For six months he had been the subject of cough and pain in the left side, and had been vomiting much.

Symptoms on admission.—There were unequivocal signs of vomicæ in the lungs, and bed sores existed on the back to a considerable degree. He died about 14 days after admission into the Hospital.

Post-mortem examination—*Thorax and Abdomen.*—The lungs contained large numbers of scrofulous deposits, and vomicæ of considerable size. On the left side the pleural adhesions were very numerous, and the pleura itself unusually thick and indurated, having at one part attained the thickness of half an inch, and acquired the outward appearance of a layer of cartilage. On the

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The cornea in this case gradually became opaque, and remained so for several years, during which this patient remained under the author's observation. The left side of the face did not recover its sensibility.

right side the pleural adhesions were seen to contain a great number of finely injected blood vessels. The other thoracic and all the abdominal organs were natural.

Cranium.—The scalp, cranial bones, and cerebral membranes were all natural, but coating the under or free surface of the dura-mater covering the upper part of both cerebral hemispheres, was found a very thin and diaphanous layer of fibrin, adhering to the dura-mater with considerable tenacity. This film was perfectly free from colour, excepting occasional bloody puncta and slight masses of reddish colouring matter. Unfortunately I did not examine the membrane to ascertain its precise and microscopic characteristics.

Case 8.—*"False Membrane" attached to the inner surface of the Dura-Mater.—Softening of the Brain.—Hemiplegia following a "Fit."*

The patient was a man, J. G., aged 62, who died in St. George's Hospital in 1856.

History.—Nothing was ascertained of his previous life excepting that he had had some sort of "a fit" eight days before admission, during which he lost consciousness, and which was followed by hemiplegia on the left side and complete inability to articulate. The urine was found to contain much albumen and pus, and waxy casts of urinary tubes.

In two or three years he was able to get out of bed, and by degrees there was a slight return of power in the affected arm, but the facial paralysis and loss of speech continued. In about a month's time he was able to utter a few words; but two weeks latter he was attacked by a peculiar kind of seizure in which both arms were very convulsed for about an hour, and he was in a semi-comatose state, having at intervals fits of excitement, calling out loudly. Exhaustion became extreme, and he became very noisy and unable to sleep. He died 11 weeks after admission.

Treatment.—Consisted of counter-irritation with purging, along with the use of wine and ammonia.

Post-mortem Examination.—*Thorax.*—The lungs were much gorged. The walls of the left ventricle of the heart were much thickened, and there was some atheromatous deposit in the coronary arteries and the mitral valve-flaps.

Abdomen.—The kidneys were very granular and cysted, and in the left one was a small abscess found to be communicating with a large accumulation of pus behind the kidney, which passed through the various lumbar muscles of the part, and occupied a portion of the left psoas muscle. No diseased bone existed, and this condition of things was apparently connected with large sloughs and bed sores on the back.

Cranium.—The cranial bones were rather thinned. The dura-mater was healthy itself; but lining it on both sides of the false cerebri, corresponding to the upper part of the cerebral hemispheres, was a thin but substantial layer of fibrine, of a pinkish colour, owing to its being stained with blood admixed. The arachnoïd membrane covering the vertex as well as the base of the brain was much thickened and opaque in patches, and much sub-arachnoïdean fluid existed.

A large portion of the upper and middle part of the left cerebral hemisphere was found extensively softened, the softened parts being chiefly of a greyish hue, except at the surface where it was yellowish in colour.

Case 9.—*"False Membrane" lining the Dura-Mater covering both Cerebral Hemispheres; from a case of Carcinoma of the Liver.*

The patient, a woman, R. P., aged 33, died in St. George's Hospital, 1853.

Previous History.—She had been for two years previously subject to sickness and vomiting of bitter and acid fluid from the stomach; and two months ago she had had pain, attended by swelling, in the right hypochondriac region.

Symptoms on admission.—The skin generally was of a yellow hue. The bowels were confined. There was a firm growth of some kind apparently in connection with the liver, of considerable size, and the seat of much pain on pressure. After a time the patient's countenance assumed a highly cachectic appearance, and it seemed probable that the disease was one of a malignant character. After a temporary improvement the hard growth rapidly increased in size, extending quite across the abdomen.

The patient became extremely emaciated, aphthæ appeared on the lining of the mouth, and she sank from exhaustion several months after admission, the mental faculties and all power of muscular movement being retained to the last.

Post-mortem Examination.—The body was greatly emaciated, and presented several purpuric spots on its surface.

Thorax and Abdomen.—The right pleural cavity contained much serous fluid which greatly compressed the lung. The left lung was congested at its apex, contained some scrofulous deposit.

The liver was extensively affected by carcinomatous growth, partly of the so-called fungoïd, and partly of the melanotic form. The other abdominal organs were natural.

Cranium.—The scalp and the cranial bones were natural. The brain was natural. The cerebral membranes were themselves also natural; but lining the free surface of the dura-mater, as it covered the vertex of either cerebral hemisphere, was a consistent layer of soft yellowish-coloured fibrin. Nothing unusual was noticed about the sub-arachnoïd spaces.

Case 10.—*"Thin False Membrane" of soft fibrinous material lining the Dura-Mater.—Disease of the Spleen and general Lymphatic Glands following Fever.*

The patient, a woman, aged 39, died in St. George's Hospital, 1856.

Previous History.—She was a housemaid, who had enjoyed good general health until she had a smart attack of fever one month before she became an inmate of the hospital; during her recovery from the fever she found an enlargement in the left hypochondrium which continued to increase in size.

Symptoms on admission.—The general appearance was cachectic. The pulse was very frequent, and the bowels costive: there was much distension of the abdomen and indistinct fluctuation. No vomiting. Much uric acid existed in the urine. In spite of treatment the abdominal distension increased, and she became the subject of an erysipelatous attack of the scalp. Subsequently, fluctuation became very decided in the abdomen, and dyspnœa, along with albumen in the urine and much enlargement of the lymphatic glands in the groin and neck came on. She died about a month after admission.

Post-mortem Examination.—*Thorax and Abdomen.*—The pleural cavities contained very much turbid fluid; and an increased quantity of fluid existed in the pericardiac sac. The heart was healthy, but the lymphatic glands about the root of the aorta were very large and indurated.

The general cavity of the abdomen contained much clear fluid. The spleen was very enlarged, weighing 4 lbs., and was the seat of a peculiar deposit of a brown and yellowish-white colour; and similar deposit existed in the substance of the liver and in the dorsal, lumbar, pelvic, femoral, and iliac lymphatic glands. The kidneys were highly granular, &c.

Cranium.—The scalp and cranial bones were natural. The dura-mater covering the upper parts of the cerebral hemispheres, was lined by a very thin layer of soft fibrine, discoloured by specks of bloody colouring matter. The cerebral membranes themselves, as well as the substance of the brain, were quite natural. The cranial sinuses were natural.

Microscopical Examination.—The enlargement of the various sets of lymphatic glands, as well as the peculiar masses of deposit found in the liver and spleen, were found to be owing to the presence of peculiar cell-bodies chiefly resembling, for the most part, the white corpuscles of the blood.*

Case 11.—*"False Membrane" lining the inner surface of the Dura-Mater, from a case in which one of the Cerebellar, as well as one of the Coronary Arteries, was found to contain a Fibrinous Plug.—Fibrin adherent to the inner surface of the Heart.*

The patient, a boy, aged 16, died in St. George's Hospital, 1856.

Previous History.—He had enjoyed good health until 3 or 4 days before admission, when, after a longish walk, he became affected by pain in the head; and after supper had an attack of sickness. On the following morning he became unconscious, and had been so ever since.

Symptoms on admission.—His general aspect was rather that of one suffering from fever. The pulse was 140 per minute. The urine was found to contain much albumen. The night was passed in a very restless condition, and on the following day he died.

Post-mortem Examination.—*Thorax and Abdomen.*—The pleural membranes and lungs were natural. The heart was, as to cavities, walls, &c., natural; but a large amount of old-standing and softened fibrinous material was found in connection with the flaps of the mitral valve, and upon the inner surface of the left auricle of the heart; and a plug of fibrine was met with in a branch of one of the coronary arteries, at which point the artery was dilated to almost the size of a large pea.

Masses of fibrinous material were also found in the substance of the spleen and kidneys, and also lying attached to the mucous surface of part of the colon.

Cranium.—The scalp and cranial bones were natural. The brain itself was quite natural, but its vessels were congested. A branch of one of the cerebellar arteries on the right side contained a small fibrinous plug; and in the super-

* The exact description of these cell-bodies, as well as that of others found in the blood of the splenic and azygos veins, will be seen in vol. xi of the Transactions of the Pathological Society, p. 247, where, owing to the peculiar enlargements of the glands, the case is given at large.

ficial part of the corresponding portion of the cerebellum blood was found extravasated, equal in quantity to the size of a pea. On examining the dura-mater, its inner surface, where covering the upper part of both cerebral hemispheres, was seen to be lined by a thin layer of reddish fibrin which was slightly adherent to the membrane. This layer existed to a greater extent on the dura-mater covering the right side of the brain.

Microscopical Examination.—The soft layer coating the dura-mater was found to consist of a simple, almost homogeneous structure containing only oval nuclear bodies, with also, here and there, delicate processes like young blood vessels.

Case 12.—*"False Membrane" lining the Dura-Mater in parts, from a case of Phthisis.*

The patient was a woman, C. S., aged 31, who died in St. George's Hospital, 1856.

History.—The symptoms were those of phthisis simply, nothing further of note presenting itself. She gradually sank and died.

Post-mortem Examination.—*Thorax and Abdomen.*—Scrofulous deposit and vomicæ were found in the lungs and also in the liver and kidneys, and connected with the peritoneum.

Cranium.—The cranium bones were natural. The dura-mater generally was natural; but lining its inner surface at the anterior part, and on both sides of the falx, was a coating of fibrine of a pinkish-white hue, and capable without difficulty of being peeled off, the dura-mater. The left lateral sinus contained a quantity of old-standing fibrinous clot partially undergoing change.

Scrofulous deposits were found in connection with the arachnoïd membrane in various parts.

Case 13.—*"False Membrane" lining the Dura-Mater.—From a patient who had a Cyst in the Brain of old standing, but who died with Abscess in the Pelvis, in connection with diseased Prostate.*

This case was fully described in the "Transactions of the Pathological Society,"* on account of the cyst in the corpus striatum and the attendant partial paralysis of the arm and leg of the opposite side of the body. It was then mentioned, but the fact was not dwelt upon, that the dura-mater was in many places very adherent to the calvarium, and that lining the dura-mater to some extent over the cerebral hemispheres, a thin layer of false membrane existed, here and there blood-stained, but otherwise almost discoloured. On *microscopical examination* of the delicate false membrane vast numbers of delicate fibres with large distinct oat-shaped nuclei were seen, and occasional very large round and oval bodies with dark refracting contents; and also much granular matter, red and white blood corpuscles, and "distinct capillary vessels" with regular nuclei in their walls.

History.—The patient was a man aged 62, whose mind had always apparently been affected, and also was said to have been partially paralyzed since a child. He was brought into St. George's Hospital owing to retention of urine and enlarged prostate, and sank and died three weeks after admission. After death

* Vol. vii. p. 8.

the urinary bladder was found very inflamed and the prostate enlarged, and there was a false passage at the posterior part of the cavernous portion of the urethra leading into a sloughing canal, and abscess between the bladder and rectum. The kidneys were also granular.

Case 14.—*"False Membrane" attached to the Inner Surface of the Dura-Mater, and forming a Cyst containing the remains of a clot of extravasated blood.*

This specimen consists of a portion of the dura-mater having attached to its inner surface a double layer of thin, soft, false membrane easily lacerable, which originally formed a cyst containing coagulated blood. This membrane has been divided in two or three places, so as clearly to expose a large portion of the contained clot, which is seen to be very shrunken and mostly, but not entirely discoloured. At the upper part of the preparation the false membrane may be seen reddened by red puncta. In one or two parts the opposite walls of the membranous bag are firmly united to each other by dense fibrous tissue; and in other places, (the adhesion having been broken through) remnants of intervening tissue are seen pendant from the surface.

Microscopical Examination.—The whole of the false membrane presented a delicately fibrous structure, the fibres being for the most part wavy, and containing, although sparingly, small oval and round cells. No blood vessels could be seen in any part of the membrane.

The contracted blood-clot was seen to present the ordinary appearance of such substance.*

History.—This I regret to say is altogether wanting, as also all particulars of the rest of the post-mortem examination.

Case 15, *with Plate VI.—Epileptic Convulsions connected with Dentition.—Large amount of False Membrane lining the Dura-Mater in almost every part.—The Brain in general hardened but in some parts softened.*

The patient was a boy aged 2¼ years, who died under the care of Mr. Cæsar Hawkins.

History.—The child had been always in good health until he was two months old, when he suffered much from dentition. Considerable febrile disturbance accompanied the protrusion of the teeth, attended by several convulsive seizures, which continued at variable intervals during the rest of the patient's life.

Symptoms.—The convulsive attacks, which were such as are wont to exist in children, connected with teething, were followed by unconsciousness lasting for the period of a week. The child was quite insensible to the calls of nature except that of hunger. He could not stand on his legs but he could freely move them. The pupils became very dilated and inactive to the influence of light, and frequent general convulsions for the space of ten days preceded death.

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* The preparation is now in St. George's Hospital Pathological Museum, as No. 1. b. Subseries vi. Series xxi.

In the same section numbered 2. 3 and 4, are three other cysts with dense walls, which originally contained blood, and were found in the arachnoïd cavity. Two of these are described by Mr. Hewett, in the "Transactions of the Royal Medical and Chirurgical Society," vol. xxviii, page 61, and the other is described in vol. vi, of the "Transactions of the Pathological Society," page 8, by Dr. Quain and Mr. Hewett.

Post-mortem Examination.—*Cranial Cavity.*—The cranial bones and the integuments covering them were natural. The dura-mater itself was natural; but lining the inner surface of this membrane to a great extent, as it covers the cerebral hemispheres on both sides was a very thick layer of firm fibrinous material.* This layer was originally no less than about three lines in thickness in most parts. The inner surface of almost the entire dura-mater was lined by this membrane, *see Plate* VI., a portion at the base of the cranium only, for a short space around the optic nerves being excepted. Between the membrane just described (the so-called false membrane) and the surface of the visceral arachnoïd, (*i.e.*, in the so termed arachnoïd cavity) about half-a-pint of serum existed; and beneath the proper arachnoïd membrane which was slightly firmer and thicker than usual serous fluid existed also. This thick membrane lining the dura-mater, I have been enabled to divide and split up into several layers (*c. c. c.*) and of these subdivisions, the outer one is of great tenuity and almost translucent, and the innermost layer is of a like character, but of a rusty-brown colour towards the vertex of the cranium, and rather roughened on its surface. The middle-most layer is very thick and has a parchment-like character, and is also of a rusty-brown hue, possessing, moreover, several projections of an opaque substance on both its aspects, which, as well as the roughnesses adverted to in connection with the innermost layer were evidently of the same nature as the fibrinous membranes themselves, and were simply formed by accumulations of fibrine around the several small vessels, which passed through the false membrane, and which are well known so frequently to exist in the neighbourhood of the great superior longitudinal sinus, passing from the surface of the convolutions to join the veins within the dura-mater. At least this is the only interpretation which suggests itself to any mind, of these mammilated elevations. On either side of the falx cerebri, and at the angles formed by this portion of the dura-mater and the other portions, exists a thick rounded pedicle-like mass (*d. d.*) cut abruptly across and presenting several rounded apertures where the section has been made. Through one of these openings I have passed a bristle, and this is seen to enter the superior longitudinal sinus, with which, in fact, all the openings communicate. This mass, looking so much like a pedicle, is, without doubt, formed by the matting together of several veins just before their termination in the sinus, by fibrin such as the false membranes themselves are composed of, and seems to exhibit on a large scale an explanation of the small elevations on the false membranes above described. The cut veins as well as the sinus with which they communicate contained a quantity of loose brown fibrine. The pia-mater generally was vascular, but not otherwise affected. The cerebrum was firmer generally than it should be, and the convolutions were wider apart than usual, but posterior to the lateral convolutions the substance of the brain was much softened. The medullary parts of the brain were generally of a yellowish tint. The cerebellum was also indurated.

The other organs of the body were natural.

Microscopical appearance.—On examining portions of these false membranes they were found to consist mainly of firm fibrillated tissue almost entirely of a wavy character. This was the case as well in the thicker, stronger, and coarser layers, as in the delicate almost diaphanous layer Along with this wavy fibrous tissue, numbers (in some parts very abundant indeed) of round and oval nucleus-like bodies existed, generally of the size of white blood corpuscles and in most cases nucleated, the nucleus being small and brightly refracting; and here and there larger oval granular bodies were seen, numbers also of very small round and spindle, or oat-shaped cell-bodies, were met with at times. In places, but very rarely indeed, rather large blood-vessels with thin walls were seen, possessing but few nuclei in their parietes In places also numbers of variously-shaped coloured bodies were seen, evidently the remains of the colouring matter of the blood.

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* The preparation of the dura-mater and the false membranes, may be seen in St. George's Hospital Museum, as No. 2, a. Subseries vi, Series xxi.

Case 3.—*Acute Pericarditis with effusion.—Recovery with adhesion of the two surfaces of the Pericardium.—Absence of any Rheumatic affection.*

From the notes of Mr. C. H. Allfrey, Cl., Cl.

PLATE VII.

Charles Rome, æt. 20, (vol. ii. p. 10), a single man, was admitted into King's College Hospital on January 20, 1860, under the care of Dr. Beale. He is an artilleryman, and was stationed until lately at Longford, in Ireland. His family are all healthy, and he himself has never had a day's illness since childhood, when he says he had brain fever. He has lived well and temperately; and is a well-nourished and muscular man, 5 ft. 8 in. in height, and 10 st. 3 lbs. in weight. States that he has never had rheumatism.

Present attack.—The patient was in excellent health till Wednesday, January 4th, on which day after two hours' riding with his regiment (at Longford), he began to feel very dull and tired and weak. The next day the weakness had very much increased. His breath was short and a cough came on, accompanied by running at the eyes and nose. He did not, however, expectorate much. He seems to have continued much the same for a day or two, but then he was unable to sleep and he applied for leave of absence and came home on January 10th. He was obliged to lay up, but yet did not improve. On January 19th he first noticed that his feet were swelled, and applied for admission into the hospital.

Present condition.—The patient is flushed about the face. He complains of great weakness, and can only walk about a little. His breath is very short, so that he can with great difficulty ascend stairs. Coughs a good deal. The expectoration is not so copious as it has been. His feet are a good deal swollen and pit on pressure; the superficial veins over the instep are very turgid. He does not complain of pains in the body or limbs, but admits that there is a slight pain in the chest. Appetite very bad; tongue furred in the middle. Bowels rather confined. Sleeps badly. The chest does not expand freely. There is dulness of the lower three-quarters of the right side of the chest behind, and bronchial breathing is heard over circumscribed spots, and especially at a small spot situated near the inferior angle of the scapula. There is rhonchus and crepitation over nearly the whole of the chest. The præcordial dulness is very much increased, extending upwards to the fourth rib; inwards to the right edge of the sternum, whilst towards the left it reaches to about an inch beyond the mammilla; no bruit can be detected, but the heart's action is very irregular and tumultuous. A rubbing sound is heard near the sternum. The pulse intermits very frequently and is very irregular, 112. R. 34.

There is no albumen in the urine. He was ordered to lie quite still, turpentine stupes were applied to the chest, and a linseed-meal poultice over the region of the heart. He was put upon ammonia and chloric ether and half an ounce of brandy every three hours.

Four days after admission (twenty days after the commencement of his illness), the following note was made: The dulness now extends from the third rib downwards and reaches about an inch over the median line to the right. It extends on the left nearly to the middle of the side. Not the slightest impulse can be felt on pressing over the region of the heart firmly with the hand. Breathing can be heard as low as the sixth rib, and more or less distinctly all over the space described as dull. The sound elicited on percussion over the space is as dull as that produced by striking the thigh. A distinct rub can be heard from the fourth rib downwards as far as the cartilage of the seventh rib. It can be

heard an inch to the right of the middle line and at the lower part there is a distinct to and fro sound. Behind, the breathing is coarse below the spine of the scapula (right), but not bronchial. (Bronchial breathing was distinctly heard on the 21st, 22nd, 23rd.) There is slight dulness over the right side, behind. The pulse intermits almost completely every third beat.

After the above date the pulse fell to 90, the tongue began to clean, and the appetite to improve; the œdema of the legs disappeared; the dulness gradually diminished; and the rubbing sound became louder every day, and on the 28th was heard all over the dull space. The patient now declared himself free from all distress; the pulse however was 106. On February 4th (eleven days from the date at which the dulness was most extensive, and thirty-one days from the commencement of the attack), a marked diminution of the extent of the dulness occurred; the upper limit being between the fourth and fifth ribs, the right limit corresponding to the right edge of the sternum, and the left being slightly within the mammilla. In the course of the two following days it had diminished to that size, which it has since permanently retained, being bounded to the right by the left edge of the sternum, above by the fifth rib, and to the left extending to about an inch internal to the mammilla. The patient was then allowed to get up and appeared pretty well, but the pulse never fell below 100, and always intermitted, generally once every third beat. The rubbing continued very distinct till February 8th, when it began to grow fainter. The extent of the dulness on different days is seen by referring to plate vii, fig. 2, marks the second, and 3, the third rib; *a*, shows the limit of the dulness, from January 20th to February 3rd, when it was diminished; *b*, indicates the limit of dulness on February 4th, *c*, on the 6th. The rubbing sound was heard at the points marked by dots in the space *d*, on the 24th, and over the entire space *d* on the 26th.

The patient was now convalescent, and was ordered to take three times a-day, Tr. ferri sesq. M.xx. in infusion of quassia. A week afterwards (Febuary 15th), the patient was discharged. The rubbing was scarcely audible; the pulse was 136 when he stood up, and very irregular. He was found to weigh 8st. 11lbs., having before his illness weighed 10st. 3lbs. The rubbing was still audible on February 21st.

Readmission.—The patient after he left the hospital, did not take proper care of himself. He became ill again and was re-admitted on March 5th (two months after the commencement of the first illness, and three weeks after he left the hospital), with great distress of breathing. His face was livid and bloated. His legs and feet were swollen and pitted on pressure. The heart's impulse was very feeble. The dulness extended to its original limits (see plate.) The pulse was very irregular, and so rapid that it could not be counted.

The breathing on the left side behind was very harsh, and the expiration prolonged, dependent probably upon a certain amount of compression of the lung produced by the distended pericardium. For the next week he remained in much the same state; but the distress of breathing ceased the day after his re-admission. A fortnight after re-admission, the dulness in the cardiac region had not perceptibly diminished in extent, and he was ordered to rub in mercurial ointment with opium. In the course of a week after the commencement of this treatment, great improvement had taken place; the extent of the dulness gradually diminished, and the rubbing sound re-appeared, but the pulse remained weak and fluttering, varying from 100 to 120. The respiration became hurried if he attempted to exert himself. Adhesion of the surfaces of the pericardium was probably again taking place, and the fluid had been nearly all absorbed. He was, therefore, again made an out-patient.

*Clinical Remarks.**—It is very rare to meet with cases of acute pericarditis with effusion, occurring independently of rheumatic fever. This man's attack appears to have originated

* Abstract from Dr. Beale's Clinical Lecture on the case.

in a cold from exposure, but throughout the whole course of the malady there was no indication of rheumatic affection. All the symptoms from which he suffered appear referable to the heart affection. The amount of effusion in the pericardium was very great, as indicated by the shading in the figure (plate VII.). The œdema of the legs depended probably upon an impediment to the return of blood to the heart, created by the pressure exerted by the distended pericardium. The treatment resorted to, consisted chiefly of counter-irritation by turpentine stupes, linseed-meal poultices over the heart, ammonia and chloric ether with a moderate quantity of brandy (two to four ounces in twenty-four hours). Had the patient been very restless, opium would have been given, and mercurial ointment would have been rubbed in over the heart; but as he was carefully watched from day to day, it was evident that he was progressing as satisfactorily as could be expected, and we therefore thought it better to adhere to the treatment above described, believing that the fluid would be gradually re-absorbed, if the patient's strength and nutrition were properly kept up. This man was under treatment less than four weeks, and the whole of the fluid effused into the pericardium, which at one time must have been very considerable, was probably re-absorbed. The most favourable result which could be hoped for, in such a case, the adhesion of the two surfaces of the pericardium, certainly occurred. The man left the hospital; but about three weeks afterwards, in consequence, probably, of want of care on the patient's part, the effusion re-appeared and the pericardium was again distended to its former size. The fluid was again absorbed under the influence of mercurial inunction, and the patient left the hospital a second time.

This man still remains under observation. He suffers from great difficulty of breathing, his pulse is weak, very quick and fluttering, and he is quite unable to work. He was discharged from the army after the first attack.

Case 4.—*Chronic Bronchitis.—Emphysema.—Enlarged right side of the Heart.—Anasarca.*

Reported by Mr. C. J. Workman, Cl., Cl.

Maria Dyke, aged 44, was admitted into King's College Hospital, under the care of Dr. Beale, January 4th, 1860. She has been married twelve years, but has never had any family; has never had any severe illness, but five years ago first

became subject to winter cough. It seems that about two years and a-half since she had an attack of general dropsy, which commenced in her feet and from which she recovered perfectly in the course of five or six weeks.

Present condition, January 5.—The patient has a bloated appearance. The lips are of a dark colour. There is general dropsy, which commenced five or six weeks before her admission. At the present time there is distinct pitting on pressure over the sternum, and still more so over the back. She has a slight cough, but does not expectorate at all; there is some distress in breathing, but no orthopnœa.

The *chest* is large and barrel-shaped, and moves less than natural on violent inspiratory efforts.

On *percussion* there is dulness under the right clavicle *in front*, extending as low as the interval between the fourth and fifth rib. The rest of the chest on that side is resonant, and also on the other side. *Behind*, the right side is resonant; and on the left, there is resonant percussion below the angle of the scapula. Above this point there is some dulness.

On *auscultation.*—Rhonchus and sibilus are heard all over the chest *behind*, with occasional slight crepitation; the respiratory murmur is about *five* times the length of the inspiratory, and is accompanied by a cooing sound.

In front the breathing is bronchial on the right side beneath the clavicle, and is accompanied by moist crepitation, sometimes amounting to gurgling. This sound is heard as low as the dulness extends.* The expiratory murmur has the same character as behind. R. 28 per minute. The heart's sounds are feeble, and heard most distinctly in the scrobiculus cordis, they are both of the same length. The impulse is weak and felt in the scrobiculus cordis towards the left side. The cardiac dulness extends to about one inch on the right of the median line, and from the level of the nipple downwards to the scrobiculus cordis. It does not extend beyond the normal limits on the left side. The pulse is feeble.

The abdomen is tympanitic everywhere except over the liver, which appears to be somewhat enlarged, and reaches downwards to the umbilicus. *Urine* free from albumen.

Ordered turpentine stupes over the back and front of the chest, three times a day, and ammonia in decoction of senega, and half an ounce of wine every two hours.

She passed but little water and on the following day, half a drachm of spirits of nitre was added to each dose of the mixture. There being no diminution in the distress of breating, a mustard emetic was given which produced considerable relief for a short time. As she was becoming weaker, it was considered necessary to increase the quantity of stimulants, and half an ounce of brandy was ordered to be given every three hours. Compound spirits of juniper, compound decoction of broom and gin were subsequently tried, but no diuretic effect was produced. The anasarca increased rather than diminished; the distress of breathing was not relieved, although it did not rise in frequency to more than thirty until the day before she died. There was scarcely any expectoration. On the 10th the pulse which had previously been about 100 increased to 120, and a slight trace of albumen appeared in the urine. The patient's strength gradually failed and she died on the morning of the 11th, a week after admission.

Postmortem.—Twenty-seven hours after death. Body well nourished, everywhere œdematous, face bloated, skin dusky, lips livid. Surface of the body generally pale, except the feet, on which are a few patches caused by congestion of the capillaries. Layer of adipose tissue over the abdominal wall, more than half an inch in thickness.

The left lung large, full of air, apparently emphysematous, nearly twice the volume of the right.

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* Dr. Beale remarked that the gurgling in this case probably depended upon dilated bronchial tubes, and the dulness upon some condensation of the lung.

The right lung appears small and hard, much harder than the left, much contracted in size; the *upper lobe* solid and firm; on making a section, it appears to contain but little healthy structure; numerous dilated bronchi were observed, but not to the extent often seen, some of them were nearly a quarter of an inch in diameter; the pulmonary tissue appeared as if it had been compressed, probably, at some considerable period before the present attack. The lower two lobes are crepitant but throughout, the bronchi appeared dilated. The posterior lower portion was a little congested, but this was probably post-mortem. The apex was firmly adherent to thorax.

The heart is rounded and somewhat enlarged, apex rounded and formed by the right ventricle. The right auricle and ventricle fully distended with perfectly black coagula; the walls of the right ventricle nearly half an inch in thickness.

The pulmonary artery admitted 2 fingers readily.

The inferior cava admitted 2 fingers readily.

The right auriculo-ventricular opening admitted 4 fingers.

The *tricuspid* valve thickened, especially towards the free margins, its surfaces somewhat roughened and puckered up.

The left ventricle contained clots of black blood, but was not distened. Walls of aorta perfectly healthy, considerable thickening and rigidity of the attached border of the semilunar valves, which in other parts seem healthy. Curtains of the *mitral* valve thickened and puckered up, much resembling those on the opposite side. The lining membrane of the left auricle thicker than usual, and easily peeled off. The heart, when empty, weighed $12\frac{1}{4}$ oz.

The *liver* reached down to the umbilicus; the gall bladder was very much distended with small gall stones, some of which were square. There were old adhesions between the gall bladder and great omentum, and adjacent parts of the liver. Liver everywhere hard, its capsule thickened and contained a perfectly white spot on left lobe. Tissue of liver pale with points of congestion, which were apparently caused by blood in the intra-lobular veins. Weighs 3 lbs. $2\frac{3}{4}$ oz. The other organs were examined and found healthy.

The two kidneys weighed $12\frac{3}{4}$ oz. The spleen $3\frac{1}{2}$ oz.

*Clinical Remarks.**—This case afforded an excellent example of the changes which frequently result from chronic winter cough,—important alteration in the lung tissue, and, consequently impaired action of the organs. This was followed by engorgement of the right side of the heart, dilatation of the right cavities, leading to impeded circulation in the systemic veins, and general dropsy.

The diagnosis in the present case, was made easily and confidently. The bloated face, the blue hands, lips and feet, the extreme distress of breathing, clearly showed that the respiratory changes were not properly carried on, and that dark blood was circulating in the arteries and capillaries of the body as well as in the veins.

The large smooth barrel-shaped chest, with almost projecting intercostal spaces, the walls of which scarcely moved after the most violent inspiratory efforts; the prolonged expiratory murmur occupying five times the length of time required for forcible inspiration; the resonance on percussion; the rhonchus,

* Abstract from Dr. Beale's observations on the case

sibilus, and cooing respiration, heard upon listening to the chest, clearly showed that the elasticity of the lung tissue was very much impaired. The distended pulsating external jugular veins, the increased dulness beyond the median line of the sternum, and the heart's impulse in the scrobiculus cordis, proved that regurgitation of blood took place at each systole, from the right ventricle through the dilated and unclosed auriculo-ventricular opening, and showed that the right cavities of the heart had suffered from the impediment to the circulation of the blood through the lungs. The two attacks of general dropsy but too clearly indicated, that the impediment to the pulmonary circulation was producing serious effects in all parts of the system, that the capillaries were dilated and gorged with dark blood, quite unfitted to supply nutriment to the tissues, and which failed to give off, through the different emunctories those products of decay, the retention of which in the system is incompatible with life.

A very interesting point in connection with the physical signs, was the presence of gurgling under the right clavicle, over a space where the percussion was dull. The general condition of the patient, her nutrition, and the history of her malady, induced the formation of a positive opinion, that the gurgling did not depend upon the existence of a cavity, while other considerations fully justified the conclusion, that there were in this region, dilated bronchial tubes containing secretion, and that the air passing through these produced the gurgling sound that was heard.

ON A SIMPLE AND ACCURATE METHOD OF RECORDING PHYSICAL SIGNS.

By Lionel Beale, M.B., F.R.S.

Fellow of the Royal College of Physicians.

PLATES VII AND VIII.

LATELY I have been in the habit of recording the exact situation of physical signs, by the aid of blank outlines of the chest, which can thus be filled up from day to day. Piorry has illustrated many of his published cases by illustrations of this kind. The plan about to be described is far more accurate and leads to more useful results, than can be obtained by describing the position and limit of the signs in words. There is, too, a great advantage in observing, as we can do by a glance

at the drawing, the seat of the dulness, crepitation, &c., instead of being compelled to read through a long description, which, however minute and careful it may be, cannot reach the same accurate precision as is afforded by a drawing. I have long advocated the importance of drawing microscopical appearances of objects, in preference to detailed descriptions, and believe that many of the same remarks will apply to the point under consideration. Whenever possible, we should substitute drawings for descriptions. It is only right that everyone earnestly desirous of being useful to his fellow labourers, should endeavour to increase the facility with which ideas may be made intelligible to others. In our profession, the engraver may be called in to relieve the printing press much more frequently than is now our habit, and I think that many branches of knowledge may often be more quickly, simply, and accurately expressed in drawings than in words.

In the hope of facilitating somewhat the plan of accurately recording physical signs, I have had three views taken of the male and female figure, engraved in outline (Plates VII, VIII).

The physical signs can be easily expressed in the small outline plans, by different varieties of pencil shading or by coloured chalk. I believe private practitioners will find these of great use, for although they cannot record long and minute descriptions of a case, they can, if furnished with such outlines, in half a minute transfer, with the aid of a pencil or pen, to one of these forms, the exact extent of dulness, &c., which they may observe. I have, therefore, had a number of these struck off, and they can be supplied at the cost of two shillings for fifty copies.*

In publishing cases in this Journal, the same forms will be used, and the shading, &c., will be indicated by printing from a wood block on the plates. See Plate VII.

In describing to a class the physical signs in a case, a large diagram in outline will be found very useful. The tints and lines may be drawn with charcoal, which can be very readily rubbed out.

There are many other means of facilitating the process of reporting medical cases, and of tabulating the results, which will be from time to time reported, and, I trust, that some of these will be found practically useful, and ere long carried out. We shall thus be enabled to increase the precision and accuracy of the diagnosis, and, at the same, time to use fewer words in expressing the results of our observations.

* 25 copies of the female, and 25 of the male outlines, are arranged together, and can be obtained by forwarding 24 postage stamps to the Editor.

ORIGINAL RESEARCHES IN PHYSIOLOGY AND PATHOLOGY.

ON CONNECTIVE TISSUE.

By S. Martyn, M.D., M.R.C.P.

Physician to the Bristol General Hospital.

PLATE IX.

THE term "connective tissue," has not been much used as yet in England. It is the equivalent of "Bindegewebe," and has been adopted lately by those who have followed, in this country, the interesting observations of continental histologists; I say "followed," because there is no doubt that, for some years past, German workers have been the pioneers of this investigation. In 1858-59, for instance, about twenty authors made observations and advanced theories of importance with regard to this element, but it does not seem to have occupied the attention of English histologists, and of the abovementioned number a very large majority were Germans. For want of better terms then, let "connective tissue" stand for "Bindegewebe," and "connective substances" for "Bindesubstanzen," a distinction necessarily retained for the present, but which, when our comprehension of the several included topics shall be more perfect, it is to be hoped we may be able to discard.

A twofold interest is attached to this subject. In the first place, by exact microscopic study of the elements in connective tissue, a large number of bodily textures have been recognized as related to each other, not merely in intimate arrangement, but also in their physiology and genesis, so that a great addition to morphology has been the result. In the second place, a very important application of the same study has been made to pathological phenomena. It not too much to say that "cellular pathology," with all its ramifications, is based on

and rooted in the doctrine of connective substance. It is difficult to forsee to what extent the views of Professor Virchow and his followers, will be accepted, now that his latest work is in the hands of English readers; but there can be no doubt that the condensed ideas, steadily pursued and developed through nineteen volumes of the Archives of Pathology, deserve the most impartial attention. In these allied tissues, of which we now purpose a review, it is, this school of pathologists assert, that morbid processes begin, in modes and localities, and travel through channels which are necessarily related, because truly homologous.

Without further preface, as the present object is simply to elucidate these structures, and show in how far they have a right to be thought related, I shall ask attention to some of the commonest connective tissues, with a view to determine their actual constitution; and, as an individual well-marked instance, will begin with a tendon. Now, simple as it seems, leading microscopists are not agreed as to this structure, and so, while fully aware that there are many difficulties to encounter, I shall have to lay before you the view adopted, after careful reconsideration, by myself.

Tendon is a specimen of dense connective (white fibrous) tissue, mixed with elastic (yellow fibrous) tissue, and requires examination by means of longitudinal and transverse sections (figs. 1, 2, 3). In a human tendo Achillis there are seen, in longitudinal sections; 1, cells; 2, fibres; 3, a substance which I shall call "extracellular."

As the *cells* are more difficult to understand in proportion as their age advances, I have figured them, in fig. 2, from the infant at birth. They are then fusiform, forked, or caudate, including a long, dark bordered nucleus, and are prolonged into fibres, which, when traced upwards or downwards, lead to other cells also including nuclei. These fusiform cells are arranged at pretty regular intervals throughout the tissue, and have a great tendency to sit closely to the large nuclei, and thus their presence is often marked only by the existence of a sort of triangular gap, above and below the nucleus. This arrangement might be represented by an oblong opaque mass, lying in a glass tube, which, when red hot, had been drawn out fine in each direction. In the adult tendon some of the cells have become still more closely attached to their nuclei, and their prolongations are so very fine as to escape notice readily, while in others a metamorphosis into fibres has taken place.

Secondly, we see *fibres;* in part proceeding from, and in part meandering between the cells. These fibres are the elastic

tissue in a very rudimentary condition, and we recur to them afterwards in a tissue which presents them more developed. Here it is, however, that we may see their origin and watch their growth. The finely drawn-out cell just described, may have become thicker, more drawn out, and long enough to extend across the entire field of the microscope, as a fibre of elastic tissue. On the other hand, the whole section will be found to present fine fibres, as is also the case even in the adult tendon, arising from the cells, and consisting of the drawn out cell walls. To see these in adult tendon we may proceed as follows: a very thin section of the half dried tendon is to be freed from fat, by dipping several times into ether, and instantly pressing it between folds of blotting paper. Having expanded freely to its original width in water containing glycerine, it must be placed under a power of 300 diams. Selecting a favourable edge of the section, a drop of dilute nitric acid (20 p. c.) is allowed to penetrate; the whole becomes rapidly pale, and the cells may be distinctly seen to have fine fibres attached to their points. Here and there a nucleus will shrivel and curl up, so as to become apparently or even really detached from its processes. These fibres are very fine, they often require the smallest amount of light to be seen, and it is not easy to measure their thickness when accidentally isolated; I have often found it to be less than $\frac{1}{10000}$ of an inch. Acetic acid renders them invisible, leaving the elastic fibres of a higher development unaffected, so that the cells seem to be merely nuclei, and the fibres to have no relation to them; the truth being that the coarse fibre is never attached, in adult tendon, to cells retaining their typical form, while the true fine fibres, which are attached to such cells, have disappeared.

Thirdly, there is between the cells and fibres, a *substance* for which we shall afterwards find the right name to be "extracellular." This is a grey, longitudinally striated mass, which may be torn into smaller and smaller bundles but not into ultimate fibrils.

In transverse sections (Fig. 1) all the three elements are distinct, but another appearance is now added, to which great importance has been attached. Each cell has several processes radiating from it, and, especially in young specimens, there is a clear anastomosis between the cavities in the radii of adjacent stars. It was in studying the mode by which nutritive matters travel through ultravascular textures that Virchow observed these stellate bodies to resemble very strikingly the lacunæ and canaliculi of bone, and he therefore concluded that these struc-

tures were similarly arranged for what he called an "intermediate juice channel system." In this view he is followed by Kölliker, who decides on the name "plasm" cells as applicable to all the cellular constituents of connective tissue. On the other side, Henle not only explains away the stellate forms, but, failing to find any fibres at all attached to the cells, declares these to be "vestiges of fœtal organs,—destined at most to preserve interstices." Now, if the views above advanced are correct, it is evident that each of these great opposing statements contains an admixture of error and truth. Virchow is right as to the existence of processes from the cells, for there are such in the longitudinal direction, and right, of course, as to the existence and anastomosis of stellate cavities (Plate IX., Fig. 1). That these, however, are not processes from the cells is equally certain. They are frequently seen without either a cell or fibre in the centre; they retain their forms, as was shown by Henle, if the preparation be viewed from the other side; they disappear under the influence of acids (Fig. 3.); and they are not seen in a longitudinal section. All these effects are incompatible with the idea of them as processes, especially the last; for were such their true nature it is certain thy would be seen, in the longitudinal section, to occupy a transverse direction; and this is not the case. There is no other possible explanation of their absence than that they are planes, which, in the longitudinal section, cannot obstruct light enough to be seen, doing so however when cut across. They must, therefore, be true interstitial spaces formed by the junction of two, three, or more bundles of the extracellular substance, and at such junctions the cells are frequently situated. On the other hand the idea of Henle that cells in connective tissue are, like sundry other vestiges of fœtal organs, obsolete, is a far too transcendental morphology: it is much more probable that these, and similar bodies elsewhere, deserve the name long ago bestowed on them by Goodsir—"centres of nutrition" or "germinal spots." From the observations of cellular pathologists we may confirm this proposition, for it is either in or near the "permanent nuclei" of tissues that diseased processes begin. I say in *or near*, because, having been hitherto unable to see the first step of a new formation like pus, tubercle, or cancer, as actually consisting in a division of original nuclei, it seems to me that this point should be reserved. Besides, having shown the stellate structure of connective tissue to be not a cell but an interfascicular cavity and not even a cavity until opened out by manipulation, it follows

that, should it be found infarcted with heterologous material, this may be truly extracellular, though in the neighbourhood of, and somehow originating in, the nucleus.

We have now reviewed the structure of *dense* connective tissue as it appears in a tendon, which is a mass of well-nourished tissue combining great pliancy with tenacity, and which, with a perfect capability of repair, yet subserves a purpose of the mechanically passive kind. Besides tendons and ligaments, we find the dense connective constituting fibrous tunics enveloping bones, muscles, nerves, brain, glands, and in fact most organs; the lower layers of serous and mucous membranes, as well as of true skin; the coats of all vessels in part; and, mixed with another element, the so called fibro-cartilages.

There is again a form of connective tissue the characters of which are looseness and softness of texture, and which occurs throughout the organism as a means of uniting and isolating various parts. It unites the skin to subjacent organs; it forms an outer sheath for any vessel, nerve, or muscle-fibre, between which and other parts free movement has to take place; it often becomes fatty tissue and so forms a padding and packing for the organs. In all these various forms the three constituents on which we have insisted are nearly if not quite constant. The tenacity and elasticity vary according to the requirements of each case, being in proportion to the development of the elastic element, and the cohesion between the bundles of extracellular substance. An examination of the loose variety of connective is by no means so easy as is apt to be imagined. In the case of a fragment of the delicate web separating the fascicles of muscle we are familar with what used to be called cellular, and is now generally termed "areolar" tissue; *i.e.*, striated, wavy bands, with occasional corpuscles and elastic fibres, which become very distinct under the influence of acetic acid (Todd and Bowman, I., 74). With regard to each of these elements questions arise, some of which I have already attempted to answer. The elastic element is, in this case, much more developed than in tendon, and was formerly called "yellow fibrous," a name which, as it is neither yellow nor fibrous of necessity, may be abandoned; while, as it seems always to confer elasticity, a name thence derived may be provisionally retained. The "elastic" fibres then are distinguished in this case by their curled, wavy course, yellowish colour, and tendency to subdivision. They never arise from cells in the adult, but a portion of their length may often be found to present a wide, flattened and fusiform appearance; it is sufficiently established that they arise from the

"nuclear fibres," or delicate cells and processes existing at an early period. According as elasticity is required, so do these very fine cell processes undergo a change into the thickened, yellowish, flattened, and branched condition, in which they have absorbed the cell from which they were derived, and entirely altered their chemical constitution; for whereas in the fine and thin state they are soluble in acetic acid, when developed into true elastic tissue they resist all reagents except in so concentrated a form as to frustrate any further analysis. Repeated observations, with a power of 1000 diameters, have convinced me that the fine fibres are both finer and more extensively distributed than we are generally given to suppose. Loose connective tissue is everywhere pervaded by them, and that they arise from the cells scattered throughout it is highly probable. The true relations of fine fibres were indicated by Todd and Bowman (I., 74 and 75), but a satisfactory demonstration has not yet been made, on account of the great difficulties attending even the most careful manipulation. In every well-arranged specimen isolated cells may be found in open spaces between the wavy bundles, and, if the light be properly moderated, a series of fine fibres may almost always be found to radiate from each cell in several directions. Some, but not all of these, may result from accidental entanglement, and I feel convinced that the origin of the fibre from the cell closely surrounding its nucleus, is the correct interpretation of this appearance.

To turn now to the development of these various components of connective tissue; it has seemed to me, in regarding the above mentioned and other similar fibres as processes from cells, that the whole theory of "cell processes" required revision. Elastic tissue at an early period, say at birth, occurs as fusiform nucleated cells arranged in a linear series and united by irregular and often pointed processes. The mind recalls early stages as well as later conditions of all cell networks: thus, stellate pigment, bone, nerve, lymphatic, and capillary structures, may be adduced as instances of what is usually understood to be the result of cells sending out prolongations or processes which meet and coalesce so as to become a network of tubes. To discuss this important question would lead me far beyond the limits of the present paper, and I will at present simply ask these questions:—Are we sure that we know how these pictures were brought about? Do we know that one of these cells independently sends out a pointed process? Must a nucleated tube be formed by cells which have arranged themselves in rows, and coalesced by absorbtion of partitions? My own belief is entirely opposed to the received idea. To me a

fine and impermeable (or nearly) young capillary is no more a process from a cell than the thread made by the receding twine spinner is a *process* from his bundle, and which is rather left behind by his moving away. So cells, already as embryonic structures, undergo division into several individuals, but the constrictions at the points of division may become elongated by removal of the nuclei-holding centres from one another. As one nuclear centre recedes from another the cell is, so to speak, ligatured; but, though this proceed to a virtual cell division, delicate fibres, overlooked usually by the microscopist, continue to unite the members of the new brood. These while serving as guiding threads for subsequent formations, would, in one case, become hardened into solid elastic bands, and, in another, dilated and modified into a capillary, or process of a multipolar nerve cell. The blood cells of the embryo chick actually pass through a stage in which they are for the time united only by a stretched thread. When, however, after cell division in the longitudinal way, the cell contents become highly modified and increased, the act of ligature is prevented and a long tubular cell results, like the striated muscular fibre; the nuclei in its sarcolemma indicating an origin from one cell which divided *quoad* its primary nucleus but not cellwall. I cannot deny the possible coalesence of a linear series of cells by absorbtion, but should demand very much stronger evidence for any particular case than is usually at hand. The important indication of these views is primarily that certain forms assumed by tissues are not formative acts of the cell-wall, but the results of mechanical action exercised upon it from within or from without. In the case of connective tissue we have next to ask, how, on the above principle, do the fibres of elastic tissue arise?—how are they spun?

This leads directly to the development of the remaining element, the pale, striated, and wavy bands. Since the scheme propounded by Schwann that, at an early stage, connective tissue consisted of fusiform nucleated cells, becoming fibrous and splitting at their ends, the most distinguished theories have varied as follows. According to Henle, there was first a blastema, becoming ultimately fibrous, and in which nuclei existed; these sent out processes which united to form "nuclear fibres." Reichert placed as the first step the existence of cells, between which an intercellular substance was deposited, a substance which never became truly fibrous, and had never consisted of fusiform cells, as stated by Schwann; with this, then, the original cells blended, and nuclear spots remained behind. Virchow, however, first clearly enunciated that, though the

intercellular substance is not a modification of what was the formative cell, still that there is a cell present, and permanent too as such, and not merely as a nucleus; and that this cell sends out processes forming the various stellate and fusiform figures which we have already discussed. Each of these, and, indeed, many other observations and inferences made by recent writers, as Luschka, Beneke, H. Müller, and Billroth, contain valuable portions of the truth; and although Virchow has elaborated so complete a theory as to have received the adhesion of Kölliker, it will be observed that, if the view we have endeavoured to maintain is the right one, considerable alterations must be made in the most advanced conception of the early and late morphology of connective and elastic tissue.

I hold that at the earliest period what is to become connective tissue consists of embryonic cells, in contact with each other; and that the next change is a division, in longitudinal directions, of the nucleus; at the same time a deposit takes place on the outside, and probably only on *one* (the nuclear?) side of the dividing cell. This is the extracellular substance, the outer, or secondary cell-wall, corresponding to the cellulose wall of vegetable cells. This deposit is made in layers, and is striated accordingly; extending then, chiefly in a longitudinal direction, it carries with it the nucleated centres of its generating cell. Thus do these centres become separated from each other, and the intermediate cell is reduced to a delicate thread. Some of these cell networks become transformed into thicker and stronger bands, and so on ultimately into elastic tissue; others remain, elasticity not being much required, in their primitive state. If, at the first appearance of extracellular deposit, the tissue be torn up for examination, the "matrix" will separate into longitudinal fibrous-looking masses, more or less fusiform, and each having its generating cell attached. This is the scheme which Schwann figured, and to which Kölliker, accedes to the extent of the cellular nature of the fusiform masses. But, from every point of view, even the drawings of Schwann themselves, I am led to believe that there is no including membrane, and that these must be considered as true fragments, although genetic unities, of what I have called "extracellular" deposit. As the metamorphosis proceeds the long wavy bands result, in various directions between and around which wander the elastic fibres at very acute angles; so that, if any one bundle be expanded violently by acetic acid, the well-known spiral constrictions are produced by what have then become nearly transverse ligatures. Much unnecessary confusion has been introduced in explaining this simple phenomenon, a very elaborate disquisition of which,

by Dr. Klopsch, may be found in Müller's Archives for 1857 (p. 417–435). His conclusions do not stand the test of further investigation. We have already seen Virchow's and Kölliker's view to be that the cell-processes form a system of channels for nutritive fluids (plasm cells). Now, as I have already shown the stellate forms to be interfascicular, it remains to inquire whether the elastic fibres can be tubes for the above purpose. Virchow believes that they are so (Cell. Path. p. 94); and, indeed, some of the most important propositions of cellular pathology hinge on this idea of a permeable cell network in connective substances. But, though all prolongations of cells must be conceived of as hollow at first, I have been unable to convince myself that the elastic fibre retains that character; in fact, very thin sections of tendon, moistened with glycerine, and viewed with high powers, show the cut ends of the fibres with no trace of a central canal, or point of a medullary kind. It seems to me rather rash to assume the persistence of a tubular character in fibres of the finest kind when we cannot demonstrate it in coarser ones. The only approach to a proof of such a structure is that in injections of cornea and tendon with indigo, made by Wittich, the blue particles were found to have permeated the fusiform elements of a longitudinal section; but it should be remembered that if there be a space between the bundles, in which the cells and fibres lie, the colouring matter must accumulate in contact with them; in fact, the investigation requires confirmation with extraordinary care before we can give our adhesion to any conclusions. There is no *a priori* reason for seeking a system of nutritive canals in the tissue under consideration; certainly no more than in cartilage, where we know that nutritive matter must pass through the intervening solid substance from blood-vessel to cell, or from cell to cell.

It was in 1845 that Reichert ventured on the generalization which has proved of such great histological interest. He classed together with "connective" those tissues which are nearly related to it in character; and thus "connective substance" has come to be reckoned as one of the great primary orders of structures. If we divide all tissues into four groups, 1, Cell Substances; 2, Muscle Substances; 3, Nerve Substances; 4, Connective Substances; we find that there is a truth underlying this classification, and justifying at all events its temporary adoption.

The fourth group includes, by pretty general consent, the vitreous humour; *mucous tissue*, one which occurs in lower animals and certain gelatinous tissues of the embryo, but in one

adult structure only, namely, *cartilage; connective tissue*, including the elastic element; and *bone*, including teeth. According to Kölliker, the differences between these structures are so great, that they are united only by corresponding function, in as far as they all either support or connect various parts of the body; and by allied genesis, for they all are more or less, at early or late periods, convertible one into another. There is, nevertheless, a true morphological relation between these tissues, for they all consist of cells more or less branched in character, and having a substance outside them, the order in which I have placed them above according with the progressive degrees in which branching and anastomosis ascend. Chemically, too, all these substances are allied in yielding either gelatine, or, what is very similar, chondrine. Although it is to the genius of Reichert that we owe the theory of the connective group, it must not be supposed that the scheme was laid down at once in its present extensive application. Reichert's paper had remained for five years without much other notice than contradiction, when an important move was made by certain demonstrations of Virchow, Kölliker, and Sharpey, who showed that, pathologically and normally, bone is developed from connective tissue; and that the latter, when about to ossify, often assumes the character of cartilage. Almost at the same time (1851–52) Donders, Henle, Remak, and others, described the "nuclear fibres," their attachment to cells or nuclei, and their possible development into elastic tissue. The excellent compendium of the present state of this subject lately given in Kölliker's work renders further historical notice less necessary, and indeed it would be foreign to the object of this paper. I purpose rather to show that the difficulties still felt as to the homologies and metamorphic development of connective elements may have some light thrown upon them by what has been stated.

A synopsis of existing theories, drawn up last year by Kölliker, may be condensed as follows:—1, Remak: The basis of connective substance is developed out of an outer secondary membrane of the cell, and there is no intercellular substance at all. 2, Reichert: Basis of cartilage intercellular, of connective developed out of roundish long cells and a substance between them, blending. 3, Kölliker and Sharpey: Basis of cartilage and mucous tissue mostly intercellular, but partly formed of an outer cell-wall: it is in connective tissue, formed by melting together of cells, along with which, in certain cases, there is an intercellular substance. 4, Donders and Virchow: Basis intercellular, not developed out of cells.

There appear, at first sight, to be hopeless differences

between these formulæ; but the more we think them out and collate them with the facts, the more they blend, ceasing at length to be antagonistic. The extreme views of Remak and Virchow may be shown actually to meet; while, in the case of the other two, the separation of cartilage as to its constitution from the other members of the connective group is the most prominent point of difficulty; and this I believe to be unjustifiable, and productive of much confusion.

In attempting to prove this, it is necessary to make a comparison of cartilage, both in its complete and early state, with a vegetable tissue on one side and connective tissue on the other. In vegetable no less than in animal tissues, the so-called "intercellular matter" has furnished a vexed question; and as those who advocate the existence of such a structure have asserted its presence to be indisputable in the frond of "Porphyra," I have given a drawing from this very seaweed to show how, with ordinary care, the debated structure may be explained. Each cell (Fig. 4) is a clearly-defined, dark, primordial utricle, immediately around which is its cellulose wall; but between one cellulose wall and another is a variable space (intercellular) which is, however, resolvable by moderated transmission of light into several layers, the true origin of which is apparent enough. Growth has here proceeded by cell-division; the nucleus and primordial utricle having divided, each half becomes surrounded by a new cellulose cell-wall, *included* in the dilated older one; and, as this goes on, the old cell-walls become more and more numerous around any particular group in proportion to the number of its elements. Modified by age, and pressed into angles by newly encroaching groups, these layers at length resemble a true "intercellular" substance, as the rough plan in Fig. 6 may help to explain.

I suppose no histologist would deny the analogy between vegetable structure and that of cartilage when presenting a capsular arrangement, or during its early stages. (See Virch. Cell. Path., Figs. 1, 2.) The formation of cartilage is a familiar anatomical object; substitute for primordial utricle, cartilage cell, for cellulose wall, cartilage capsule, and the above description of vegetable growth applies in almost every particular to that of cartilage. Even in far advanced stages of cartilage growth, as in the cricoid of a lamb (Fig. 5), a structure is seen, to which all I have said of Porphyra equally applies, and in which there is no trace of any intercellular, or as it must here be called intercapsular, substance. Whether the lines or laminations become obliterated or no, the facts of development were

similar; and it seems impossible to doubt, where a wide hyaline space occurs between cartilage capsules, that this so-called matrix was built up in the same way, and that it therefore consists of old, dilated and blended capsules. Apply now this analogy, which we find between cartilage and a vegetable tissue, to connective tissue itself. The cell of connective tissue, with its great power of resisting chemical reagents, and its tendency to become modified by splitting into elastic fibres, is the analogon of the cartilage cell. They possess similar qualities, seem to be allied in composition, and, in fact, at any point where connective tissue is affixed to embryonic cartilage, a gradual transition may be easily seen from connective tissue cells to cartilage cells. Near such a junction the cartilage cell becomes elongated, generally at one end, so as to present a long sharp point, often wavy, and bearing too close a resemblance to elastic fibre cells to allow of doubt as to their being homologous. But in cartilage there is the capsule or chondrine yielding deposit without the cell-wall; while in connective tissue this must be represented by the "intercellular" part, the gelatine yielding matrix. It would be easy to show many points of similarity between the extracellular deposit of connective and the extracellular deposit of cartilage; but perhaps enough has been said to explain the above-mentioned four theories. If extracellular deposit be synonymous with outer cell-wall, or accumulated outer cell-walls, as I have endeavoured to show, the views of Remak and Virchow are to be understood as follows: the one states that no intercellular substance exists in connective, the other, that all between those defined elements, the commonly called "nuclei of fibrous tissue" is intercellular. Its non-existence means that all you see is cell-wall of some sort, though it be *outer* cell-wall, the "nuclei" being by rights elevated to the rank of cells. That there is nothing in the matrix but intercellular substance (Virchow) is to say that, even if connected with, and a deposit from, cells, it is not the cell-wall; not the primordial, but only a secondary structure. Both these statements being tenable, I should regard any contention between their adherents to be one of terms. Reichert insists on a true intercellular substance in cartilage; but this we have already seen to consist, like that of Porphyra, of former capsules, while it is the latest capsule which differs in its interesting and not yet investigated structural arrangement from former ones, or the erroneously so-called mother-cells in contact with it. Kölliker refuses to allow the complete parallelism of connective substances chiefly for the three following reasons. In mucous tissue there is a distinct structureless intercellular substance;

an argument of no great importance, even if the cell network of this gelatinous tissue becomes fibrous at last, for the capsule of cartilage is often laminated while the matrix without it is structureless and may even be semi-fluid. Secondly, because there are in connective tissue true corpuscles having no connection with elastic elemental cells—a point which, I think, is answered by the almost invariable attachment of extremely fine fibres to connective cells indiscriminately. Lastly, his belief in formative cells of the basis of connective (in the sense of Schwann) involves another difference from cartilage, which vanishes at once if the fusiform bodies be viewed as extracellular fragments, in the way explained above.

In conclusion, I would protest against the attachment of undue value or reverence to this classification of particular tissues as one group. The points which connective substances have in common, though exclusive, are not very numerous; and nothing can be more useless than to arrange amongst them all tissues which are formed from stellate or fusiform modifications of embryonic cells, as, for instance, the capillaries and terminal nerve plexuses. Indeed, were not the apostles of the connective theory, as for example Leydig, so serious in pressing tissues into their favourite ranks, we might have suspected them of an attempt, by an undermining irony, to destroy the whole systematic fabric.

The parts of which an embryonic nucleated cell is composed meet with various fates, according to the demanded function. If the reproductive act is especially required, or metamorphic power to be retained, the nucleus is the chief agent. Vegetative functions of nutrition and rejection are performed by the cell-walls, or by tissues developed out of cell-walls. The animal functions, or those of muscle and nerve, are executed by the modified contents of cells. But if the mechanical function of elasticity is in request, this quality in the cell-wall becomes exaggerated to the loss of other qualities; while, if mere passive resistance is to be exercised, a deposit takes place for the purpose *outside* the cell, whose remaining powers then sink, more or less, into abeyance. In the two last cases, the embryonic cell has originated what may be distinctively termed a "connective substance."

REPORTS OF RESEARCHES PUBLISHED ELSEWHERE.

ON CELLULAR PATHOLOGY.

Report by A. B. Duffin, M.D.

Assistant Physician to King's College Hospital.

THE appearance of another edition of Professor Virchow's interesting work induces us to attempt a more extended analysis of some of his opinions than has, as yet, been issued to the profession.

The views advocated are so original, so comprehensive, and so imperfectly known or understood in this country that, although many commentaries upon them may be already extant, we feel an impartial review of the chief pathological modifications that are urged in the volume before us to be still called for. In his introductory lecture Virchow recognises the claim of the cell to be considered as the ultimate form-element of all vital phenomena; and he asserts, that all activity must be regarded as emanating from the elements of the tissue as such. The living element can, however, only be considered as active so long as it represents a unity. After a comparison of the animal with the vegetable cell, which induces him to consider the cell membrane as the equivalent of the primordial utricle, he assigns to the nucleus the office of preserving and of multiplying the elements as living parts, whilst he refers the function of the part to the cell contents. The cell, as a whole, is assumed to exercise a certain power beyond its own boundaries, so as to regulate the life of a given amount of the interstitial material that surrounds it. This latter may be so small in quantity that the individual cells may be regarded practically as apposed, or it may so increase as to separate them considerably, or in a third variety of tissue a reticular arrangement of stellate elements may sustain cell continuity whilst admitting the presence of a large amount of interstitial material. But in every case each cell pursues its own path, and experiences its specific changes without necessarily involving the fate of its

neighbours. Each cell has its own territory, and the whole animal represents the sum of such vital entities. The theories of free cell formation advocated by Schleiden and Schwann are then analysed and rejected, and the principle is laid down that no development begins, *de novo*, but that equivocal generation must be as decidedly rejected in the history of the development of the individual parts as in that of entire organisms. "Wherever a cell originates, there a cell must have gone before; *omnis cellula ē cellulâ*, just as an animal can only originate from an animal, a plant from a plant; a constant law of continuous development exists."

Upon this general hypothesis Virchow proceeds to found his broadest classification of tissues.

"There is one point of view whence all normal tissues may easily be grouped into three categories.

"Either you have tissues that consist exclusively of cells, where cell is apposed to cell, in the modern acceptation, cell-tissue. Or you find tissues where each cell is regularly separated from its neighbour by a certain interstitial mass, (the intercellular substance) in which consequently, a kind of binding material exists, visibly uniting the cells to each other, but simultaneously keeping them asunder. To this division belong those tissues that are usually comprehended under the denomination of tissues of the connective substance (Bindegewebe), and among which what was formerly understood as cellular tissue plays the most important part. Finally you have a third group of tissues in which specific developments of cells have taken place, so that a peculiar arrangement has been obtained, an arrangement in part so peculiar, as to apply exclusively to the animal economy. These tissues more especially characterise the animal, although a few of them present transitions to the vegetable forms. Hither belong the muscular and nervous systems, the vessels and the blood."

"The second of these histological groups is delineated in so original a manner that we here venture to quote largely, more especially as a great number of German pathologists esteem it one of the most important agents in pathological processes."

"Formerly, connective tissue (Bindegewebe) was almost universally held to be essentially composed of fibres. If loose connective tissue from different regions be examined, *e.g.*, subcutaneous areolar tissue, pia-mater, submucous or subserous cell tissue, loose bundles of fibres will be found (like locks of hair) the lock connective tissue. This appearance of locks which recurs at certain intervals, so that a variety of fasciculi are produced, was the more positively referred to the existence

of individual fibres, as in fact isolated threads are often seen to project from the ends of the bundles. Nevertheless a most important attack was some ten years ago directed against this theory. Reichert endeavoured to demonstrate that these fibres were merely the optical expression of folds, and that connective tissue everywhere formed a homogeneous mass possessing a great tendency to the formation of folds."

"Schwann assumed that spindle-shaped cellular elements existed primarily, the famous *tailed bodies* (fibro-plastic bodies of Lebert) and that from them fasciculi of connective tissue were derived, the body of the cell splitting up into individual fibres, whilst the nucleus remained unchanged. Henlé, on the other hand, inferred from the development that no cells were originally present at all, but that nuclei were formed in the blastema at regular intervals; the fibres of a later period originated in the direct cleavage of the blastema itself. Whilst the interstitial mass was thus differentiating itself to fibres, he assumed that the nuclei gradually lengthened, so as at last to come in contact, and give rise to those peculiar long fibres, the nuclei fibres. In opposition to these views Reichert has made a most important advance. He proved that an enormous multitude of cells, separated by a certain amount of intercellular mass, was alone originally present. He believed, however, that at a given period the cell membrane and the intercellular mass became fused, and that a stage supervened, analogous to that described by Heulé, when the boundary between the old cell and the interstitial mass ceased to exist. Finally, he presumed that the nuclei in some forms entirely vanished, but that they were retained in others. On the other hand, Reichert strenuously denied the existence of Schwann's spindle-shaped elements. He regarded all spindle-shaped, tailed or angular elements as artificial productions, just as the fibres in the interstitial mass were a false deduction from an optical picture."

"My own investigations have taught me that the observations as well of Schwann as of Reichert are valid to a certain extent. Firstly, against Reichert, that true stellate and spindle-shaped elements undoubtedly exist, but then against Schwann and with Reichert, that a direct cleavage of the cells to fibres does not take place, but rather, that what is subsequently recognised as connective tissue occupies the situation of the previous homogeneous intercellular substance; I found, further, that Reichert as well as Henlé and Schwann were wrong, when they finally only left nuclei or nuclei-fibres; that on the contrary, the cells themselves were retained. The connective tissue of a later period is in no wise differentiated from the connective tissue of

an earlier date, either in general structure or in disposition. There is not an embryonic connective tissue with spindles and a developed one without them, but the elements remain the same, although they may be sometimes difficult to follow. In everything essential this entire group of low tissues can be reduced to a simple plan. As a rule the greater part of the tissue is composed of intercellular substance in which cells are imbedded at certain intervals, and these may have the most various forms. But the tissues cannot be so distinguished that the one only contains round cells, the other only tailed or stellate cells, but rounded, long or angular elements may be detected in all the tissues of the connective series."

Virchow illustrates this latter remark by a reference to articular cartilage. He finds the cartilage cells to become spindle-shaped with some fibrillation of the intercellular substance, so as greatly to resemble connective tissue close to the surface of the joint. If traced away from the joint they become star-shaped, and gradually pass into connective tissue. Adipose tissue he also identifies with the connective series, as he supposes the corpuscles simply to become filled with fat. But a number of other formations are also classed with this group. Thus, it is argued, that the lacunæ of bone represent the corpuscles of connective tissue, whilst the canaliculi correspond to their tails. "I have endeavoured in various ways to prove that these (lacunæ) are really small bodies, and not simple cavities in a dense fundamental tissue; that they represent formations with special walls and proper boundaries, which can be separated from the interstitial substance," p. 75.

A great development is given to the physiological value of these cells and tails. They are asserted to have a special relation to nutrition; to imbibe various nutrient matters and to transmit them variously modified to the tissues. They are thus made complementary to the ordinary vascular system.

"The distance between two osteal vessels is often very considerable. Whole systems of lamellæ intervene between the medullary canals, and they are traversed by numerous osteal bodies. It is certainly hard to imagine the nutrition of such a complicated apparatus as being solely dependent upon the activity of a distant vessel, and especially to represent to oneself in what relation each separate particle of this great compound may stand, as regards its nutrition to the vessel. Now, experience teaches us, that in point of fact, each osteal body possesses its own nutrient relations." The district supplied by a vessel is then described as a vascular unity, and he continues "Closely examined, even this vascular unity still

appears as a complex; it does not suffice to divide the body to vascular unities, but the cell territories must also be respected. From this point of view I consider the proof of the existence of a special system of anastomosing elements in connective tissue as of peculiar importance," p. 76.

This last observation is also applied to dental tissue, the dental canals and spaces between the columns of the enamel being taken to represent the processes of the star-shaped elements. The same relation is also pointed out as existing in fibro-cartilage. Of the semilunar cartilages of the knee-joint, he says:

"These latter are still generally described as cartilage, but yield gelatin on boiling and no chondrin. Still in this hard tissue we find, just as in the cornea and in fibro-cartilage, the same system of anastomosing elements, only developed with unusual sharpness. Vessels are almost entirely absent, but we have a corneal system of unusual beauty," p. 80. Numerous other examples are given, but none perhaps are so striking as that of the umbilical cord. He describes the gelatin of Wharton, as structurally identical with connective tissue, the gelatinous part representing the expressible portion of the intercellular substance.

"The proper mass of the umbilical cord, consists of a reticulate tissue, the interspaces of which contain mucin and a few round cells, the supports of which are a fibrous substance. Within this latter lie stellate elements. If by treatment with acetic acid a good preparation be obtained, a regular network of cells will appear; this separates the mass into regular divisions, so as to render possible a uniform distribution of the nutrient material throughout the whole."

The structure of the gelatin of Wharton, coupled with that of the chorion and of the vitreous humour, all of which yield mucin, induces our author to establish a parallel between the "mucin" yielding, and the connective tissues. The former he regards as the unripe equivalent of the latter, although the transition does not necessarily occur. The mucous tissue may persist through life, as in the vitreous humor, or in states of general emaciation, the fatty may actually retrogress to mucous tissues. (Archiv. v. 14, p. 16.)

The conclusions to which Virchow would have us arrive respecting the structure of the whole group may be summed up as follows: (Ibid. p. 9.)

1. "Connective tissue early consists of closely packed cells between which a homogeneous interstitial substance appears.

2. This substance remains homogeneous or becomes fibrous.

3. The originally round cells may persist as such or become spindle or star-shaped.

4. The spindle or star-shaped cells unite, (Bindewebekörperchen.)

5. Part of the cells is modified into elastic fibres, part receives pigment, another part fat.

6. The larger number of the cells is retained in a somewhat shrivelled shape and constitutes a permanent regulating apparatus for the nutrition, the interchange of material, and the new formation of connective tissue."

Such being a rapid sketch of the main views entertained by Virchow, our readers will doubtless be curious, to know to what extent they are corroborated by other observers, and particularly how they have been received in the land of their birth. Kölliker is prepared to assent to a large portion of them, but he can only give a modified confirmation to the developmental history of connective tissue. "In connective tissue they (the cells) become transformed essentially according to two types, and are converted, firstly into connective tissue corpuscles, and secondly, into the proper cells of connective tissue, the latter of which pass into the fibrous matrix of the tissue, whilst the others persist as cells, or are converted into elastic fibres." (Manual of Human Microscopic Anatomy, p. 41, 1860.)

Leydig also gives a hesitating assent. They are on the other hand vigorously defended by C. O. Weber (Virchow's Archiv. vols. xiii.—xv.); by Friedreich (Virchow's Archiv. vol. xv.); by His (Beiträge zur normelen in Pathol. Histol. d. Cornea); by Donders, who described the corpuscles almost simultaneously with Virchow (Siebold und Kölliker's Zeitschrift, vol. iii.); by Wittich, who says that he has injected the processes of the cells with chromic acid (Archiv. vol. ix.); by Böttcher, who says he has injected them with carmine (Archiv. vol. xiii.); by Billroth, who admits all but the tubular nature of the processes (Beiträge Pathol. Histol. 1858), etc.

As we have seen they are more or less inconsistent with the views of Schwann, Reichert, and Henlé, and very recently Baur has had reason to believe that the stellate elements are nothing but the interstices between many bundles (Entw. d. Bindesubstanz, p. 28, 1858). Virchow has, however, replied to his arguments in vol. xvi. of his Archiv., p. 19.

Recent observations would tend to indicate that the question of the existence of an independent canal system is capable of a still further development. Several excellent microscopists have traced a connection between members of the group of

connective tissues and Virchow's first great class, the epithelial formations. Thus Gerlach has traced a continuity between the ciliated cells of the aqueduct of Sylvias, and the processes of the underlying connective tissue corpuscles (Mikrosk. Studien. 1858). Heidenhain has traced these processes to the cylinder epithelium of the bowel in the rabbit (Moleschott's Untersuchungen, 1858). Luschka has followed the processes to the epithelium of the endocardium (Archiv. vol. ix. p. 569). Similar observations are due to Eckhart (Beiträge anat in Physiol, 1855,) and to Billroth (Müller's Archiv. 1858), and these are regarded as highly probable by Friedreich (Archiv. vol. xv. p. 538.)

Thus the connective tissues, their analogues, and their alliances, are made to acquire an immense anatomical value, and this Virchow further extends both to the physiological and pathological relations of the economy. They afford him foundations for his great hypothesis of the individuality of the members of a tissue as consistent with their mutual dependence. We will next examine the chief bearings of this important doctrine.

"We must recognise the life of the individual parts and refer the same to a power, a motor force, which must not be regarded as the resultant of the molecular forces of the part, but as something communicated, as excited by some antecedent, a force, which although acting mechanically, cannot be mechanically compounded. There is no life but that of succession, and there must consequently be a persistent force that can be transmitted from member to member, in addition to those forces that are constantly coupled to matter. We distinguish two varieties of force within the body, the molecular and the (excited and exciting) vital force, by the joint action of which we obtain the elementary or cell force of the organic elements, in a more extended sense the vital force . . . . . But no part of the body, however autonomic its nature may be, is absolutely independent of the others. The inherited movement which has been originally excited in a given mass of material provided with molecular forces, exhausts itself against the increasing resistances, unless the motion be maintained and strengthened by the supply of new material with new affinities and antagonisms. The vital force is regenerated by the molecular forces through the method of nutrition . . . . . Thus life persists in the whole body, as in every invidual cell-territory; its uniform course is due to the harmonious, mutually compensating motion of many elements that originally

sprang from a simple element* (Allg. Formen. d. Störung u. ihren Ausgleichung, pp. 3–4–5). The physiological idea of a tissue is thus, to a great degree, brought into conformity with that derived from anatomy. It is demanded that the irritability of each cell be admitted, *i. e.*, that it should be capable of being determined to certain evidences of activity. The inference from this is, that the irritating cause (irritans) constantly resides externally to the cell, as it is only by the action and reaction subsisting between this force and those already extant within the cell, that the latter can be evidenced to the observer. This irritating cause may either act through neighbouring cells, or be communicated from a distance, *e.g.*, through the vascular or nervous systems, or have an originally independent existence. That activity is as constant as the life of the part is evidenced by Dubois-Reymond's researches into the so-called quiescent state of nerve. A cell change is thus induced, and it may either assume the form of generation, of growth, or of function, much depending as well upon the nature as upon the intensity of the exciting cause. Under all circumstances, "the idea of irritation necessarily includes that of counteractivity, and we are only justified in speaking of a part as irritable or excitable, so long as performances† proceed from it, such as neither simply pertain to the passive disturbance which has been induced from without (p. 8), nor to the molecular force which is inherent to it, although this may have a determining action on the force through which the part assimilates communicated movements and transmits them to

* Beneke has recently declared himself rather for a nuclear than for a cellular pathology (Archiv. des vereins fur gemeinsch. Arbeiter v. iv). This would scarcely affect the value of the laws here enunciated. Virchow himself admits, that the ultimate idea of his pathology is not the cell, but the life of the individual parts. (Archiv., vol. xviii, p. 10.)

† The term "performance," is here made to include the three factors, function, growth, and multiplication. Already some years ago, Virchow insisted on the necessity for accurately defining these (Archiv., viii, p. 27, ix, p. 47), and in his work on irritation and irritability, he demonstrated how function might be directly antagonistic to the idea of nutrition, as in the red blood disc, the seminal and mammary secretions; how within certain limits functional restitution might be independent of nutritive repair, as in nerve or muscle separated from the body, and submitted at intervals to stimulation; lastly, that growth or multiplication might interfere with function. He also argues, that the tendency of function should be separated from that of the other factors. "Function is essentially directed to the exterior, its chief importance is not for the part in functional activity, but for its neighbours (Reizung u. Reizbarkeit, p. 17). But in nutrition, every part is vegetative, and assures its own interests." (Archiv., vol. vi, p. 384.) Nevertheless, function becomes the ordinary excitant to nutrition, although itself excited by causes entirely extraneous. This gives the pathological value to the functio læsa. Similarly, functional formative and nutrive restitution must be separated.

neighbouring materials (p. 12)." The chief thing is, and remains, the irritation, *i. e.* the change of the tissue. It is the *primum movens* of the process, and determines the reception of more abundant contents into the tissue, even when there is no vessel in the neighbourhood, and when the only possibility that remains is that the irritated element should derive its contents from the adjoining elements" (Reizung u. Reizbarkeit Archiv. vol. xiv).

Thus we have to discriminate between the exciting causes (irritans), the local disturbance which they induce (irritamentum), and the further active disturbance of the continuous or contiguous parts which necessarily result (irritatio). Certain external influences induce disturbances of the vital elements, and certain tensions proceed from them. But the life of the parts and of the whole can only so long pursue a regular course, as it is possible to counterbalance or to remove these tensions. If this be not effected, the state of irritation (irritatio) is established, and so we are brought to the limit of healthy action. The physiological or pathological value of an irritating cause, will depend on the difficulty encountered in its neutralization, from the "character of danger" that results. As regards the tissue, "any process that materially alters its performing power, especially for any length of time, and opposes the early restitution of a regular state, must be considered as morbid." The effect will vary mainly in proportion to the nature and intensity of the irritant. The cells of the tissue may simply give evidences of functional reaction, or they may increase in size, "hypertrophy," in number, "hyperplasia," or cell derivatives may be produced at variance with the parent stock, degeneration, pathological substitution, or lastly, the death of the part may be induced, either immediately, or by a descending process of metamorphosis. That functional activity is a property of the tissue and not of the excitant, needs at the present day no circumstantial proof, still Virchow quotes Dubois-Reymond, Ludwig, Bernard, &c., on this head.

That series of processes by which nutrient irritability is evidenced is, however, far less generally admitted, that faculty of the individual parts to absorb and deal with more or less material in answer to determined stimuli. They are, moreover, made to play so large a part in the most diverse pathological phenomena, that it will not be uninteresting to note how our author handles them, and first as regards inflammation.

"A series of inflammatory processes presents in its earliest evidences, nothing beyond an increased reception of material within the cells, just as has been remarked of simple hyper-

trophy. If the history of the usual course of Bright's disease be considered, it will constantly be found that the earliest phenomenon which is to be detected, is that the epithelial cells within the still intact urinary canals, although known to be of large size, still further enlarge. The renal tubes thus get filled with epithelial cells, which are not only very large, but very hazy, inasmuch as the interior of these cells has taken up a more abundant supply of material. The entire renal tube widens, and appears to the naked eye as a tortuous, white, opaque body. If a solitary cell be isolated, a difficult task, as the cohesion of the individual cells is already apt to suffer, a granular mass will be found within it, which apparently only consists of those granules which are otherwise present in the interior of gland cells, the accumulation of which, however, becomes denser the more energetically the process advances, so that ultimately even the nucleus becomes indistinct. This is the condition of *cloudy swelling* as it is found in many irritated parts, as an expression of irritation, and as a concomitant of many forms of the so-called Inflammation. Tracing this process backwards, we find no cognizable limit between it and simple hypertrophy . . . . . In these processes it is scarcely possible to wrest from the individual element the faculty of spontaneously inducing an increased reception of material in answer to a stimulus acting directly upon them; at least, it is opposed to all empiric experience to assume, that such a reception must of necessity result from special innervation. If we select a part which all observation indicates as destitute of nerves, say the surface of an articular cartilage, we shall be able, as the beautiful experiments of Redfern long ago proved, to produce identical effects upon it by direct irritation . . . . . It would be contrary to all experience to imagine that a nerve in the medulla of the bone could exercise a special action upon those superficial cells which were the site of the irritation, without the cells which are situated between the nerve and the irritated spot being simultaneously involved. If a thread be so drawn through a cartilage, as only to cause traumatic irritation, all the cells that border the thread will increase in size by the reception of more material. The irritation which the thread occasions only extends to a certain distance into the cartilage, whilst the outlying cells are totally unaffected . . . . . There are truly few tissues in the body so destitute of nerves as cartilage; but even if the most nervous parts be traced, the extent of the irritation, or more properly the extent of the hearth of the irritation, will in no wise be found to correspond with the dimensions of any given nervous territory, but, in

an otherwise normal tissue, the size of the hearth will essentially answer to the extent of the local irritation. If this experiment be transferred to the skin, a large series of nervous territories will be cut. But the entire territories of the nerves which lie along the thread, are in no wise placed in the same pathological condition; the nutritive irritation is confined to the course of the thread and its immediate neighbourhood . . . . . In a tissue in which this relation can be very distinctly followed, in the cornea, we find nerves in a position where no more vessels reach. These nerves have a reticular arrangement, and leave smaller or larger territories between them that are entirely devoid of nerves. If any irritant be applied directly to the cornea, such as a red-hot needle, or nitrate of silver, the circuit which is thereby thrown into morbid activity, in no way corresponds to a nerve circuit. It once happened to us to pass the cautery so as exactly to touch such a nerve filament in the rabbit, but the disease only manifested itself in the neighbourhood of this spot, and certainly not in the whole province of the nerve . . . . . In the first humble attempts that I made to modify the old views, I still retained the expression "parenchymatous exudation." I had convinced myself that in many places where tumefaction ensued, absolutely nothing but tissue was to be seen. In a tissue composed of cells, even after the swelling (exudation), I saw nothing but cells, in tissues with cells and intercellular substance, only cells and intercellular substance; the individual elements certainly larger, fuller, replete with a quantity of material that they should not have contained; but I saw no exudation as it is ordinarily considered, either free or in the interstices of the tissues. All the mass was contained within the elements themselves." (Cell. pathol., pp. 270–274). A great deal is not so much exudation, as if I may so express myself, *educt from the vessels in consequence of the activity of the tissue elements themselves* (Cell. Pathol. p. 350). "An irritation of the nerves may naturally co-exist, but putting function apart, this has no connection of cause and effect with the processes in the tissue proper, but is nothing more than a collateral effect of the original disturbance" (Cell. Pathol. p. 287).

I therefore hold that in the sense in which it is usually accepted, *there is no such thing as inflammatory exudation* (Cell. Pathol. p. 356), but that the exudation that we meet with, is essentially composed of that material which is generated by the altered condition of the inflamed part, and of the *transuded* fluid which escapes from the vessels."

This last expression frees our author from a reproach that

has been levelled at him, that his devotion to the cellular theory leads him to consider the vascular relations of the part as of no account.

If then, a part possess a large number of especially superficial vessels, it will give an exudation, since the fluid which has been transuded from the blood transports the special products of the tissue to the surface. If this be not the case, there will be no exudation, but the entire process will be confined to the occurrence of those changes in the tissue that the inflammatory irritation has induced. In this manner, two forms of inflammation may be discriminated; the *purely parenchymatous,* where the process runs its course in the interior of the tissue independently of the outpouring of blood fluid, and the *secreting* (*exudative*) *inflammation,* which more properly belongs to the superficial organs, where an increased outpouring of blood fluid occurs, carrying the proper parenchymatous materials with it to the surface" (Pathologie u. Therapie).

In one of his previous works, Virchow develops the importance of the vascular system in inflammation more fully. He agrees with H. Weber in referring the local disturbances of the circulation to two sources; the pressure from the heart, which represents the ordinary cause of mobility, and the molecular attraction that is active in the capillary circulation. He considers the major part of them to be the results of the irritation, and that no part of the residue is an unfailing concomitant of inflammation. In this sense he reviews brittleness of the vascular coats (Küss), the narrowness of vessels (Williams, Brücke), and their dilatation (Jones, Paget, Brücke), whether this latter be due to temporary relaxation of the muscular structure, to permanent atony, to increased blood pressure, or to the formation of new vessels. He also corroborates Majendie and Poisseuille's observations on the importance of the composition of the blood itself, as a cause of impeded or accelerated circulation. The internal cohesion of the blood, he proposes to divide into several factors, the density of the serum, the mutual attraction of the red blood discs, their relation to the surrounding serum, and the adhesion of the whole to the wall of the vessel. Each of these is capable of modifying the circulatory pressure in the inflamed part, and may so far influence the ultimate result, but they do not constitute inflammation. The only ultimate tangible effect that they have, is to cause simple transudation. "Exudations are always phenomena of irritation, simple transudation is a result of pressure" (Reizung u. Reizbarkeit, p. 36).

Our readers will naturally inquire how all this leads to the formation of an abscess, or of pus on a free surface. Pus is

defined to be "a young tissue, gradually loosening all firm intercullar substance, in combination with a rapid cell development." There are two methods of pus formation according to the kind of tissue examined, whether it pertain to the epithelial or connective series. Whether forms of suppuration exist, that may strictly be referred to muscle and nerve, Virchow still considers doubtful.

"If the development of pus on the external skin, without ulceration, be followed, the suppuration will regularly be found to proceed from the rete malpighi. As the elements grow, the harder layers of epidermis become loosened, and are raised as a bulla or pustule. The chief site of the pus corresponds to the superficial layers of the rete that are already passing into epithelium . . . . . In the deeper layers, one can trace how the cellular elements, which originally have simple nuclei, subdivide, the nuclei multiply, many new cells occupy the place of the old one, and these again are provided with dividing nuclei . . . . . It is just the same on mucous membranes. There is no mucous membrane which may not, under circumstances, yield pus. But here also certain differences are to be noted. A mucous membrane is the more in a condition to produce pus without ulceration, the more perfectly it possesses pavement epithelium. The mucous membrane of the small intestine scarcely ever yields pus without ulceration. In the urethra, on the contrary, massive discharges of pus may exist without the slightest superficial sore, as in gonorrhœa" (Cell. Pathol. p. 401–402).

Virchow acknowledges a certain resemblance between pus, mucus and epithelium, and he refers them all to the same fundamental form; but once advanced beyond the embryonic stage, their indentity ceases. Mucous corpuscles are not young epithelium, nor pus young mucous corpuscles. Proceeding to the second method of suppuration, he argues—

"First the cells of the connective tissue enlarge, their nuclei divide, and for a while sprout enormously. To this first stage division of the elements themselves succeeds. In the neighbourhood of the irritated part, where formerly solitary cells lay, double and multiple cells will be found from which generally a kind of homologous new formation is derived. (Bindegewebe.) But towards the interior, where the elements were already full of nuclei, heaps of small cells soon appear, which at first lie in the direction of the corpuscles of the connective tissue. Somewhat later, round hearths or diffused infiltrations are found. Within these the interstitial tissue is very scanty, and is consumed in proportion as the sprouting cells advance. The tissue thus becomes infiltrated with pus

cells (abscedirt)..... These forms gradually yield the so-called granulations, which always consist of a tissue where more or less numerous round elements, at least in the growing stage of the granulation, are imbedded in a small quantity of soft intercellular substance. The more closely the surface is approached, the more do the cells, which are uni-nucleated deep down, evince division of the nuclei, so that, at the final limit, they cannot be distinguished from pus. A detachment of epithelium now occurs, the ground substance becomes more diffluent, and the individual elements may be liberated. If the vegetation be abundant, the mass is constantly breaking up, the elements are poured on the surface, and a destruction ensues which eats deeper and deeper into the tissue. Thus we have an ulcer." (Cell. Pathol. p. 405-6.)

These views have already for some time been promulgated in Germany, and were distinctly advocated by Virchow as early as 1854. (Handbuch d. speciellen Pathol. u. Therap. p. 337.) They have been the source of almost endless discussion, and are admitted with more or less reserve by Förster. (Handbuch, 1855, p. 307.) Billroth, "The source of all pathological processes leading to cell-formation, whether it conduct to the formation of solid or of fluid parts, is chiefly to be found in the connective tissue, and especially in its cells and nuclei; and the cells and nuclei of other tissues either have no share, or only participate in a very limited degree in their production." (Beiträge, Path. Histol. 1858.) His (Beiträge zur normalen u. Pathol. Histol. d. Cornea, 1856), Böttcher (Virchow's Archiv. vol. xiii. p. 227) on suppuration in muscle and tendons; C. O. Weber (Archiv. vol. xiii. p. 74, and Archiv. vol. xv) who, in an elaborate and carefully reasoned article, describes suppuration in muscle, bone, periosteum, etc. "Here first the nuclei of the corpuscles of the connective tissue increase by subdivision, synchronously with an augmentation of the original cell space. The cells sometimes assume a rounded form, sometimes retain the spindle shape; ultimately large spaces are formed which are quite filled with rounded nuclei, exhibiting 1–5 nucleoli, and which are quite similar to pus corpuscles.* But often, also, division of the cells is witnessed. In the place of a spindle-shaped body a deeply indented corpuscle is seen, then two conical cells with their bases apposed, then three or more, and in them again often growing nuclei." But it will not do to forget that these views have been much questioned, and are, we believe, still opposed by Vogel, Schwann, and Reinhardt.

* Virchow questions this method of production, and adheres only to that by successive divisions of the cells. (Archiv. vol. xviii, p. 12, 1860.)

Another highly interesting aspect of this hypothesis is its relation to a fibrinous exudation. Here much depends on the value which is attached to the fibrin itself; and we must make a slight digression, in order to state our author's estimate of it. In a former work (Archiv. vol. i, p. 570), he maintains that the term Fibrin should only be applied to the coagulated product of certain fluids, as coagulation is the sole reaction that we possess of its existence, and that the condition in which this material pre-existed in the fluid should be called fibrinogen. Arguing from the length of time required for different fluids exposed to the air to coagulate, and from the fact that lymph and chyle never coagulate within the body, he establishes an ascending series of these fibrinogens, the most imperfect of which is found in the minutest ramifications of the lymphatics and lacteals. The cause of coagulation he finds mainly in the exposure of the fibrinogenic substance to the influence of oxygen, and he considers the coagulation of blood between ligatures to constitute no objection to this view. "The blood, which has been brought to a stand by ligature, always contains a certain amount of oxygen; and if this oxygen be for the most part present in the blood discs, we might certainly anticipate that they would gradually evolve the same. If arterial blood contain more oxygen, coagulation should be more complete, and this is actually the case." (Gesammelte Abhandlungen, p. 133.)

He sums up this part of the argument by saying, "that in none of the normal fluids perfect fibrin, as such, pre-exists: on the contrary, the blood only contains a substance more nearly, the lymph and the lymphatic fluids more remotely allied to it, and that these by contact with oxygen become, sooner or later, transformed into real fibrin and then coagulate." (Gesammelte Abhandlungen, p. 133.)

In the present volume he repeats many of the elaborate observations and experiments that have led him to these conclusions. Assuming, next, that in order to obtain a fibrinous exudation a preliminary irritation of the tissue must precede, he suggests three possible methods for its occurrence. "Either the vascular coats and the tissues are rendered permeable to fibrin, which they were not before; or the elements of the tissue, after the manner of secreting cells, attract the fibrin from the blood and then expel it; or the fibrin does not originate in the blood at all, but is generated by the parts." He supports the latter hypothesis, as then lymph and exudation would fully correspond. "If serous fluid transuded from the blood-vessels, the excess of this fluid would usually pass into the lymphatics, but under pathological conditions would remain piled up in the interior of the tissue, or transude to the surface."

(P. 136.) Should the lymphatics perform their office adequately, much fibrinogenic material would be conveyed to the blood, and a hyperinosis would result. This brings rheumatic fever quite within the scope of the present theory, as there exudation is slight, hyperinosis excessive. "Thus the ultimate source of the fibrin is not to be sought for in the blood itself, but at those points where the lymphatics collect the increased fibrinous mass."

These views Virchow still adheres to. In his Cellular Pathology he argues that "fibrin, wherever it be found in the body externally to the blood, is not to be considered as an excretion from the blood, but as a local production. I have endeavoured to introduce an essential change in the interpretation of the so-called phlogistic crasis, with reference to the localization of the same. Whilst one was formerly in the habit of regarding the changed composition of the blood in inflammation as existing from the first, and as particularly characterized by the primary increase of the fibrin, I have developed the crasis as the result of the local inflammation. Certain organs and tissues possess, in an eminent degree, the faculty of generating fibrin, and of favouring its abundant presence in the blood, to which other organs are infinitely less adapted. I have further pointed out that those organs, which most frequently present this peculiar connection of a phlogistic blood with a local inflammation, are generally abundantly supplied with lymphatics, and are connected with great masses of lymphatic glands; whilst the organs, that either contain few lymphatics, or in which lymphatics are scarcely known, exercise no appreciable influence on the fibrinous composition of the blood." (Cell. Pathol. p. 148.)

The exudation, in such cases, can be considered as the excess of the locally formed fibrin, which the lymphatic circulation was incapable of removing." (Cell. Pathol, p. 150.)

We have now sketched Virchow's method of dealing with one of the most complex series of phenomena that can result from nutritive irritation. We have incidentally found how these could be combined with formative changes in the production of pus. In simple nutritive irritation the condition of the germinating centre of the cell, the nucleus, is not affected; but a certain increment in the intensity of the exciting cause, whether it act slowly or rapidly, will also involve the formative portions of the cell; and, under all circumstances, multiplication of the nucleus would seem to initiate this new series of changes.

Virchow thus found division of the nuclei of the corpuscles of connective tissue in a melanotic tumor as early as 1851.

Kölliker described multinucleate cells as constituents of the marrow of fœtal bone. (Mikrosk. Anat. vol. ii, p. 364–378.) Paget has described them as constituents of the myeloid tumor (Surg. Pathol. vii, 216–223); and great multiplication of the nuclei occurs in muscle near to the foci of irritation." (Cell. Pathol. p. 281.) Still, the pathological importance of all these does not equal that of the new formation of the cells themselves. This is the character which imparts to suppuration its prominence among the results of inflammation. Hence inflammation can never be considered as a simple process. Supposing even that the exciting cause affecting many tissues simultaneously be the same, the result will nevertheless vary with the histological value of each structure. Simple functional disturbance may result in the one, nutritive changes in a second, formative variations of different degrees of importance in a third or a fourth. The tissues that appear most susceptible of formative disturbance seem certainly to belong to the connective series. Virchow accepts this as so generally true, that he ventures to assert that, "with few reservations, the connective tissue and its equivalents may be considered as the common germ-stock of the body, from which the real development of new-formed parts is derived." (Cell. Pathol. p. 360.) This doctrine is presumed applicable to the formation of every variety of new growth; so that, with reference to this great histological law, pus and cancer may be classed side by side. The questions of rapidity of growth, persistence of vitality, etc., are, of course, not prejudged. The method of formation will take one of two directions. Either there will be simple division of the elements, as has already been described, or a series of endogenous changes may affect pre-existing cells. This latter may consist in the formation of large bladder-like spaces (Physaliden), or brood spaces filled with new elements may arise within the cells, as Virchow delineated in vol. iii. of his Archiv. He would combine the whole series of results dependent upon formative irritation under the one head of hyperplasia. When a cell mass begins to first evince formative reaction, it is impossible to determine the direction of the new growth;* but whether it be consistent with the pre-

* Weber thus refers to this part of the subject: "We see, therefore, that in most new formations the connective tissue cells take the place of brood spaces. Why, in one case, the product should be a rapidly evanescent one, as pus corpuscles; in another, a spindle-formed cell or nucleus, as in fibroid and sarcoma; in the third, a round multinucleate cell, or large pale clear nuclei, as in scirrhus and encephaloid; or, lastly, a cell with epithelial characters, and proportionately thick firm wall; that is a question that we are at present quite incapable of determining." (Archiv. vol. xv, p. 526.)

existing structure of the part, or at variance with it, he urges that the product will still be analogous to some already formed portion of the body.

Thus even the physalides of cancer have their representatives in the thymus gland; and "wherever new formations are to arise in any quantity, an analogous substitution occurs according to the type of young medullary tissue (granulation). So that, however great the consistence of the old tissue, a kind of proliferation takes place, whereby the germs of the future products are deposited." (Cell. Pathol. p. 384.)

The use of the term heterologous, in its usual acceptation, is therefore combated; and it can only be employed to indicate that either in situation, in the time of its appearance or in extent, the new growth varies from its originating tissue. An analogy exists, however, among new formations, not solely at the time of their origin, but the ways in which they ultimately terminate their existence is very similar.

Hughes Bennett (Cancerous and Cancroid Growths) some years ago described the fatty degeneration of the older portions of cancerous nodules, and the same method of resorption has long been known to prevail with inflammatory infiltrations. "The form under which cancer finally ulcerates has so much resemblance to the ulceration of pus, that the two things have been long compared." (Cell. Pathol. p. 4.)

Is there, then, any broad characteristic by which new formations may have their relative value determined? Virchow proposes the medium life of the individual elements as a criterion. "At a time when certain forms have already entered upon a retrogressive course, others first acquire their full development." Those with a fluid intercellular substance are the least adapted for persistence. But even in solid tumors it is requisite to discriminate between the entire growth and its constituent parts. We have mentioned how some of the latter may be in a state of retrogression; and even those parts whose development is most parallel must be regarded as compounded of many minute foci. It is here that the anastomoses of the connective tissue acquire such importance. The very fact of extreme persistence—particularly if coupled with a great proclivity to produce new elements—would be some criterion of the intensity of the original irritation, and would lead us to anticipate an extended radiation of its effects. This really is the case. In malignant growths, "the zone of the last disease extends considerably beyond the zone of change which the naked eye can recognise..... This is the chief source of return after extirpation." Cancer, according to this, would

have a local origin and a contagious method of growth. The more extended the anastomoses of the connective tissue, the more rapid will be the progress of the disease. A difficulty meets us as to the development of remote secondary cancers. The origin of these Virchow is inclined to refer rather to the conduction of juices than to the transport of solid particles, although he is far from denying the occasional occurrence of the latter. Virchow would, then, altogether remove malignant growths from the dyscratic forms of disease in their humoral pathological acceptation. He even goes further, and rejects blood dyscrasias *in toto*. To every dyscrasia he would assign some local position from which the blood is constantly or from time to time contaminated. "Every dyscrasia is dependent upon a permanent supply of noxious ingredients from certain points." (Cell. Pathol. p. 120.) Be it observed, that he makes a dyscrasia to depend upon a permanent addition of hurtful materials to the circulating fluids. In our fevers with a typical course, the poison is only once brought into contact with them from a local source, and thus their duration is definite. We see, indeed, a permanent result in the ulterior protection that they afford; but this is less to be referred to a change in the blood than to a modification of that element. Bennett, in his work on Tuberculosis, has assigned to a variety of faulty assimilation the local source of disturbance which would act as the exciting cause in consumption. Thus two difficulties would be removed, to our adopting the law which Virchow has recently laid down, "that up to the present time no reason exists for the admission of primary permanent dyscrasias." (Archiv. v. xviii, 1860, p. 14.)

Having now given an outline of some of the most prominent members of the ascending series of nutritive and formative changes, it remains for us briefly to analyse their course in an opposite direction. The class of disturbances which here ensues is, both in its origin and in its effects, rather of a negative than an active character. Many of them may be induced in previously healthy parts by the simple absence of physiological irritation, as in a paralysed muscle. The whole of these passive processes Virchow would class under the head of degeneration, but "there is naturally a great difference whether the element, as such, persists at all, or is utterly deprived of vitality; whether at the end of the process it be still in existence, although in a much decreased capability for action, or whether it be altogether destroyed . . . . . Herein lies the great practical distinction; there is still a possibility of cell repair in the one series of processes, whilst in the other a direct repair is impossible, and

regeneration can only result by the substitution of new elements from the surrounding parts." (Cell. Pathol. p. 289.) The last of these categories he is inclined to class apart as "necrobioses." "These necrobiotic processes, which must be entirely separated from necrosis, lead generally to an ultimate softening. This starts with brittleness of the parts; these lose their cohesion, actually at last dissolve, and more or less mobile, pulpy or fluid products come to occupy their place." (Cell. Pathol. p. 290.) He distinguishes simple indurations, where the part retains some amount of its original activity from these necrobitic forms. The most important of these latter is unquestionably fatty degeneration, of which our author gives an excellent description, which, for the most part, so entirely coincides with those of many writers in this country that it need scarcely detain us. When attacking the coats of vessels without having been preceded by any other pathological process, Virchow describes it as affecting the inner layer of the intima, so that it cannot be confounded with true atheromatous states. "If such a spot be excised, it will be found that a fatty degeneration of the connective tissue corpuscles of the intima has occurred, and as these corpuscles are branched cells, we here acquire, not the ordinary form of round granular cells, but often very long, fine formations, becoming incidentally spindle or starshaped. (Cell. Path. p. 309.)

These changes he would sedulously separate from those dependent on the true atheromatous process. In a former work* he details a number of experiments and observations that he made to ascertain—first the possibility, next the situation of inflammation in the arteries. These investigations induced him to recognise the former, but to oppose those doctrines which would acknowledge the existence of an exudation from the inner coat into the interior of the artery, as contended by Rokitansky (Spec. Path. Anat., vol. i, p. 523). On the contrary, he would rather side with Gendrin and Andral in regarding the deeper layers of the inner coat as the site of the disturbance. In the volume before us he still maintains this view, and admits inflammation as the forerunner of the proper atheromatous changes. "This kind of inflammatory affection of the wall of the vessel is in point of fact identical with what would be designated an endocarditis in the parietis of the heart. No other difference exists between the two processes than that the one has more frequently an acute, the other a chronic course." (Cell. Pathol., p. 323.) Occasionally the antecedent

* Gessamelte Abhandluugen.

inflammatory process is so active as directly to induce softening of the wall of the vessel, whilst fattily degenerated particles are to be detected in the circumference of the inflammatory focus. Usually, however, the strictly inflammatory signs are less obvious, the connective tissue elements become enlarged, but are earlier filled with fat. "On a section we observe the scattered fatty elements to become thicker and lie closer towards the centre, but generally still to retain the shape of cells; towards the exterior they become smaller and more scanty. All these cells are filled with strongly refracting fatty corpuscles. Between these fatty bodies a reticulate ground substance is interposed, the true fibrous basis of the intima, which we distinctly see prolong itself externally into the normal intima. . . . . One could imagine the fat to be deposited in interspaces betwixt the lamellæ, and there are still a few histologists who do not acknowledge that the connective tissue contains only cells and no cavities. If these parts be followed to the surface the same arrangement which is present in the fatty portions can be recognised in the simple, horny, semi-cartilaginous layers. . . . . The enlargement which the part experiences through the process, and which we call sclerosis is consequent upon an enlargement of the cellular elements of the wall and a multiplication of the nuclei, so that spaces are often found containing masses of nuclei. Thus the process starts. In many instances partition of the cell ensues, and a great number of young elements are found; these ultimately become the seat of fatty degeneration and really perish." (Cell. Pathol. pp. 328, 329.)

"The further the degeneration proceeds the more perfectly is an inclosed hearth constituted by the destruction of the deepest layers of the intima; ultimately it may fluctuate, and, on a section, a pulpy mass may be evacuated, like pus from an abscess. If this mass be examined, numerous plates of cholesterine will sparkle before the eye." (Cell. Pathol., p. 325.) Sometimes, however, the contents of these tumors is so decidedly inflammatory that the finest young cell formation, free smooth nuclei, and multinucleate cells with homogeneous cell contents may alone be evacuated, as in a case described by our author. (Gesamelte Abandlungen, p. 403.) It need scarcely be added that a second series of changes ending in ossification may terminate the inflammatory process. Virchow contends that we then have to deal with true bone and not with simple petrifaction. "This latter is usually found in the peripheral arteries, so that the condition which is ordinarily held to be a special criterion of the atheromatous process, inasmuch as the

radial artery is felt to be hard and chalky, and the popliteal and crural vessels have hard rigid walls, is no proof that we have to deal with an atheromatous state. This hardening is very frequently situated in the middle coat. The cretification actually attacks the middle coat, so that the fibrous cells of the circular layer are converted into chalky columns." (Cell. Pathol., p. 332.)

An inflammatory process in every respect similar to that which affects the arterial coats is also met with in veins. The doctrine of an inflammatory exudation into the interior of the vein is combated, and the deep layers of the inner coat are regarded as the true site of the process. This bears no necessary relation to any material subsequently found within the vein, as abscesses may form of such dimensions as to raise the inner coat up like a smallpox pustule, without the coagulation of the blood within the vein being the necessary consequence. Phlebitis may, however, become the condition for the formation of clot along the wall of the vein by causing irregularities or even ulcerations. Clot may also exist in a healthy vein without being either accompanied or followed by inflammatory signs. What then is the value of the "sequestrated pus" described by Cruveilhier in the interior of clots, and supposed to be drawn into that position from the wall of the vein by the capillary action of the coagulating fibrin? The material found is not purulent but puriform, it is due to the softening of the older layers of the clot, and is composed of finely granular detritus. This indeed occasionally encloses large cells, sometimes multinucleate, generally containing oil. These might be taken for pus cells, but the history of the clot indicates that they exist in it from its earliest formation, and consequently they are regarded as white corpuscles undergoing fatty degeneration. The red corpuscles break up much earlier, but are also found in rare instances. That an exudation should be formed on the inner surface of a vein and act as an immediately coagulating agent on the blood, according to the doctrines of Rokitansky, is considered as an entirely gratuitous hypothesis. (Spec. Anat. Path. vol. i, p. 525.) In some, "the process which is usually termed suppurative phlebitis, is neither suppurative nor phlebitis, but a process starting with coagulation and the formation of a blood thrombus, and afterwards issuing in the softening of the thrombi." (Cell. Pathol., p. 183.)

The etiology of the first formation of intravascular clot was many years ago elaborately investigated by our author, and the results were published in an elaborate series of papers,* since

* Froriep's Notizen, 1846. Traube's Beiträge, 1846. Archiv. vi, 1847.

collected in his Gesammelte Abhandlungen. It was then referred to two chief causes, slowness of the blood stream, and the presence of foreign bodies, the existence of the necessary fibrin being presupposed. "Let us then put inflammation aside, and let us adhere simply to the coagulation of the blood and to the formation of clot." (Cell. Path., p. 179.) When from any cause a portion of clot has once formed in a vessel, it acts as a nidus for the deposition of further portions of fibrin till the bore of the vessel is choked up. The older, softening layers of fibrin are thus precluded from entering the circulation; but no such protecting boundary exists laterally, and the process of softening extends till it reaches the wall of the vein; then this latter becomes affected, and pus may form within its walls. This bring us to the verge of the history of Pyäemia, and Virchow admits a close but not absolutely necessary relation between the formation of thrombi and the development of this process. The next step, after the prelimary coagulation of the fibrin in any given vessel, would appear to be the detachment, not of the softened material, which is inclosed in a kind of capsule of young clot, but of fresh portions of fibrin recently deposited at the extremity of the thrombus. A small vein first gets choked with clot, then "the thrombus is continued beyond the ostium of the branch into the trunk, in the direction of the blood stream, grows in the form of a thick cylinder, and becomes greater and greater. This propagated (fortgeseter) thrombus grows out of all proportion to the orignal (autochthonic) thrombus whence it started. The propagated thrombus may acquire the size of a thumb, whilst the original one may be only of the diameter of a knitting needle. For instance, a mass as large as a thumb may be continued from the vena lumbalis into the vena cava. These propagated plugs are the real sources of danger; disintegration affecting them may lead to the closure of distant vessels. This is the site where the blood current breaks off greater or less particles. No blood at all flows through the originally secluded vessel, the circulation there is entirely interrupted; but in the great trunk through which the blood is still flowing, and into which the plugs of thrombus project from distance to distance, the blood stream may separate smaller particles, drag them with it, and wedge them fast in some arterial or capillary system. Thus, ordinarily, thrombi from the periphery of the body cause secondary plugging and metastases in the lungs. I was long doubtful how far I might refer all metastatic pneumonias to this source, as it is very difficult to examine the vessels of the smaller metastatic hearths, but I am becoming more and more per-

suaded that this method of origin is the rule." (Cell. Pathol., pp. 185, 186.)

Thus emboli are formed. Their subsequent situation will vary according to the nature of the vessel containing the primary thrombus, and according to the size of the emboli themselves. Their effects are often perfectly imitated by fragments detached from the endocardium, as has been admirably shown by Dr. Kirkes, and by Virchow's own observations. (Med. Chir. Trans., vol. xxxv.) The brittleness of the embolus would also appear to have some regulating effect on its ultimate position, as it renders it liable to be broken up and dispersed into a very large number of small vessels. "Thus capillary emboli are constituted, one of the most important forms of metastasis, and one that frequently leads to small hearths in the kidney, the spleen, and in the substance of the heart itself." (Cell. Pathol., p. 189.) Once wedged fast, the embolus in its turn becomes enclosed in a capsule of fresh fibrin, and then undergoes chemical changes. Upon these depend the secondary importance of the whole process. If they are of a putrefactive character they will induce the most disastrous results round about them. On the contrary, both the secondary and primary disturbances may run a favourable course through the retrogressive change of both embolus and thrombus. Virchow is far from regarding pyœmic processes as exclusively dependent on the history of thrombosis.

"It is still necessary to take another fact into consideration, which is neither accessible to rough nor to minute anatomical inquiry; this is constituted by certain fluids which in themselves have no immediate or necessary relation to pus, but have obviously different constitutions and origins." (Cell. Pathol., p. 191.)

This affords a link between pyœmia and the dyscratic processes, and Virchow is inclined to admit an "ichorous infection" as one form of dyscrasia.

We are still far from having passed in review all the subjects of which this highly interesting work undertakes to treat. The description which it affords of Leukœmia, Tubercles, Ossification, Rickets, Caries, Amyloid Degeneration, etc., all, without exception, are beautifully rendered, and almost entirely original. Most of these subjects have, indeed, been largely dealt with by our author in his former publications, but nowhere do we find such elegantly worded, clear, and succinct accounts of them as in the work before us. Ere we conclude, we would venture to suggest one question, which can scarcely be said to invalidate any part of Cellular Pathology, but which would slightly modify

one of its interpretations whilst obviating one of the main difficulties to its acceptance. Is it perfectly essential that the cell as it is usually considered, that is a compound of nucleus, contents, and membrane, should always be the *primum movens?* In many situations the cell-membrane is extremely difficult of demonstration, and nowhere more so than in the secreting portion of glandular organs.* Neither does it seem to us that the existence of a cell-membrane is absolutely essential. The nucleus may represent one aggregation of matter, the cell-contents another, differentiated from the first. The nucleus may provide for the growth and multiplication of the whole, and what are usually termed the residual cell contents, in other words, the extra-nuclear aggregation of matter may preside over function. Growth would still represent molecular, multiplication numerical increase, but all the faculties of increase would be referred to the same centre, the nucleus. Thus, in inflammation, the irritation by a mere increase in its intensity could change from one faculty to its analogue, without even the site of its action being in any way changed. The one degree would lead to the existence of the cloudy swelling around the active centre, the other to the multiplication of the centre itself, either simultaneously or independently. The enormous difficulty (as Dr. Beale and others have pointed out) that there must be in acknowledging the involution of a double fold of membrane and its union with a corresponding involution from the opposite side of the cell would thus fall away. If the nucleus be considered as multiplying rapidly, the complexity of such a series of involutions would become extreme. The difficulty vanishes the moment the necessity for a cell membrane is abandoned. Then the mere force of attraction which would emanate from the nucleus would suffice to maintain a certain amount of "cell" material around it, and, when the segments of a multiplied nucleus separated, to account for the processes of cell fissure that have been described. Just as we have "cell territories" partitioned out in the intercellular substance, the cell itself would be the expression of the nucleus territory. Neither would this interfere with the conclusions to be drawn from such tissues as present a demonstrable cell-wall. This acceptation would favour E. O. Weber's observations that the nuclei themselves may become the pus cells, whilst the cell membrane melts away with the interstitial tissue to constitute the liquid portion of the pus.

We cannot close this work without again recommending it

* On some points in the Anatomy of the Liver, by Lionel Beale, 1856, p. 48.

to the perusal of our readers. It is a well-composed and agreeably written digest of those numerous and extraordinary changes that its author proposes to introduce in the history of Pathology. An acquaintance with the great principles it enunciates is essential to any man who is really anxious to go along with his times. Whether its doctrines are destined to occupy a permanent place in the edifice of medical science must still be left an open question; but the startling propositions that it broaches, the careful and extended observation that it indicates, and the talent and depth of its reasonings, all put it forward as one of the most valuable additions which this age of scientific research has experienced.

JOURNALS WITH WHICH THE "ARCHIVES OF MEDICINE" IS EXCHANGED.

Glasgow Medical Journal.

Journal de la Physiologie de l'Homme et des Animaux, publié sous la direction du Docteur E. Brown-Sèquard.

American Medical Monthly.

North American Medico-Chirurgical Review.

Archiv. für die Holländischen Beiträge zur Natur und Heilkunde.

Guy's Hospital Reports.

American Medical Times. A new series of the New York Journal of Medicine.

Journal of Practical Medicine and Surgery. English Edition.

Quarterly Journal of Dental Science.

Ophthalmic Hospital Reports and Journal of the Royal London Ophthalmic Hospital.

Archiv. für Pathologische Anatomie und Physiologie, und für Klinische Medecin. R. Virchow.

*** The Editor will be happy to exchange with any other Journals.

ANALYTICAL NOTICES OF BOOKS RECEIVED.

Prof. Kölliker. A Manual of Human Microscopic Anatomy.

This work contains 633 pages. It is a complete manual of human microscopic anatomy. The first part treats of general histology; the structure, formation, and function of cells: of the tissues, organs, and systems. *The second part* comprises special histology; of the external integument, the nails, hair, and glands of the skin: Muscular system: Osseous system: Nervous system: Digestive organs: Organs of deglutition: Stomach and intestines: Liver: Pancreas: Spleen: Organs of respiration: Urinary organs. Sexual organs: Vascular system: Of the higher organs of sense: Vision: Hearing and smell. The work is illustrated with 249 beautifully executed *wood-engravings*, and is provided with a very comprehensive and carefully arranged *index*.

Prof. Humphrey. On the Coagulation of the Blood in the venous System during Life.

The author discusses the question as to whether the mingling of fibrinous and coloured masses in clots in the pulmonary artery can be taken as evidence that the clot was formed during life, and concludes that it ought not to be so considered; but that there ought to be some sign that the blood current has acted upon the clot, or there should be adhesion to the interior of the vessel, or other evidence that it was formed before death occurred, before the above conclusion can be arrived at. He does not say that such clots, which are usually considered to have been formed before death, are invariably post-mortem, but that they *may be so*. The memoir is illustrated by a coloured plate.

Mr. Charles Hawkins. Sequel of a Case of Lithotrity.

The case was that of a man in whom a communication existed between the bladder and intestine. A calculus had formed in the bladder which had been removed by lithority. The patient recovered from the operation, but fæcal matter occasionally passed with the urine. His death seemed to be caused by general impairment of health rather than by the local disease. The opening in the bladder communicated with the sigmoid flexor of the colon, and was about the diameter of a goose-quill. The case is a good example of the value of lithotrity in complicated cases.

Mr. Henry Lee. On the radical Cure of Varicocele by Subcutaneous Incision.

The author, before dividing the vein, places a needle under the vessel both above and below the part to be divided. Ligatures are then passed round the ends of the needles and over the vein. These are allowed to remain for a couple of days, when the blood in the vein will be coagulated. The vein is next divided by subcutaneous incision, and two days afterwards the needles are removed. Cases are subjoined illustrating the success of this plan of treatment.

Dr. Camps. Case of Cerebral or Subjective Vision.

This was the case of a gentleman, aged 60, who was out of health, and was troubled both by day and by night with ocular spectres. He was annoyed by the presence of a female figure in a grey dress which appeared in different places. The impression was so strong, that he believed he saw a real object. He perfectly recovered under change of scene and attention to his general health. The author remarks, that all such phenomena arise from perverted cerebral action, and are entirely subjective, and he suggests that, in some cases, they may indicate the commencement of disease of the brain.

George Murray Humphrey, M.D., F.R.S. Observations on the Limbs of Vertebrate Animals: the Plan of their Construction; their Homology, and the Comparison of the Fore and Hind Limbs.

This work is illustrated with three plates, exhibiting outlines of the anterior and posterior extremities of various animals. The author expresses doubt as to the existence of an *archetype*, and thinks it would be better to substitute, for this term, *simple primary form*. Although there can be no doubt that nature works from a simple form, and builds upon a uniform plan, there is no reason to assume that she works up to an *ideal or archetypal pattern*. In attempting to trace approximations to, and divergences from, this supposed archetype, the author thinks the student may perhaps be fettered, rather than assisted, in his endeavour to comprehend and investigate nature's works.

Dr. Waller. Summary of his principal Physiological Researches.

It is only possible here to allude to one or two of Dr. Waller's conclusions. In 1849 the author discovered a new plan for investigating the distribution of nerve fibres, founded on the fact that the *distal* extremity of a nerve becomes disorganised when the trunk is divided. Fatty degeneration results, and by the presence of the fat globules the course of the nerve can be easily traced, upon microscopical examination, by the presence of lines of oil globules amidst sound fibres. When the sympathetic was divided in the neck, the upper segment degenerated, showing that the course of the nerve is upwards. In reunion of a divided nerve, Dr. Waller states that the *distal extremity becomes completely disorganised before reunion takes place*. Fresh nerve tubes are developed from the centre towards the periphery. Section of the posterior root of a spinal nerve causes disorganisation of the spinal portion only. Of the anterior root disorganisation of the distal portion only.

Dr. Harris. On the Nature of the Substance found in the Amyloid Degeneration of various Organs of the Body.

After alluding to the general properties of starchy matters, the author adverts to the importance of the greatest caution in investigations of this class; for Rouget has shown that it is very difficult to exclude entirely starch grains. They are found in great numbers in dust, and are often met with on the fingers. It is probable that actual starch granules derived from without have been described as amyloid bodies developed in the animal tissue. The author considers that starch has not been proved to exist in the tissues, although a substance of an amyloid nature is undoubtedly present. Two cases, in which amyloid bodies were found in the liver, and two in which they were present in the kidney, are recorded. The author concludes that these bodies are not identical with amylaceous substances, but are allied to them. No one has yet succeeded in converting amyloid bodies into sugar.

Dr. Joseph Jones. Introductory Lecture to the Course of 1859–60, in the Medical College of Georgia.

The author alludes to the responsibility of teachers, and the importance of correct medical education. He discusses the physical constitution and physiological relations of man, considers the relations of the intellectual and moral faculties, the character, order, and relative value of the different departments of knowledge in the work of education, and concludes by directing attention to the fundamental branches of medical science, and urging the student not to be contented with a superficial knowledge of the practical departments of medicine.

Dr. Eckard. De Glandularum Lymphaticarum Structura.

The author briefly states the opinions held by different observers, and then proceeds to relate his own conclusions. He seems to regard the lymphatic gland as composed of a system of imperfect canals lying in the meshes of the capillary vessels. Injection easily passes from the blood-vessels into the lymphatic trunks, and he finds that the capillaries divide into very small branches which may be traced into the trabeculæ of the gland.

Dr. Marcet. An experimental Inquiry into the Action of Alcohol on the Nervous System.

The results at which the author has arrived from numerous experiments are as follows. That alcohol acts *principally*, but not *exclusively*, on the nervous centres by means of absorption. That it exerts a *slight* but *decided* action on the nervous centres through the nerves, independently of the circulation. The action transmitted through the nerves may give rise to a shock, or temporary complete suspension of sensibility and mobility, although respiration continues, or it may produce no other visible effect than hastening death.

Dr. Joseph Jones. Observations on some of the Physical, Chemical, Physiological, and Pathological Phenomena of Malarial Fever. From the Transactions of the American Medical Association.

This volume contains the first results of a series of observations which the author is conducting upon the fevers of the North American continent. The book contains 419 closely printed pages. Numerous cases are given which have been carefully investigated. Analyses and microscopic examinations of the urine, blood, and other fluids, have been instituted, and many of the latest and most valuable physiological researches are embodied in the author's remarks. The literature of the various subjects under discussion is fully given, and numerous explanatory notes with references are added. The author also enters fully into the pathology and treatment of different forms of malarial fever.

Professor J. A. C. Giraldés. Recherches sur les Kystes Muqueux du Sinus Maxillaire. Mémoire Couronné par l'Académie des Sciences, 1853.

After referring to the anatomy of the antrum, and alluding especially to its mode of communication with the nasal fossæ, with reference to catheterism and other surgical operations, the author proceeds to describe minutely the anatomy of the mucous membrane. The tubular glands in the mucous membrane are very numerous, and when the orifice is occluded dilatation of the gland takes place behind, and thus mucous cysts of the antrum are formed. There are two varieties of these cysts: 1. *Miliary cysts*, formed by the dilatation of the peripherial part of the excretory canal. 2. *Larger cysts*, formed by the dilatation of the entire follicle. The memoir is illustrated with three well-executed plates.

Professor Bentley. On the advantages of the study of botany to the Student of Medicine. An inaugural address delivered in King's College, London, May 2nd, 1860.

After alluding to the irreparable loss science had sustained in the death of Edward Forbes, the author directs attention to the great importance of the study of natural history to the student of medicine, and alludes especially to the direct bearing of botany on practical medicine. He advocates the establishment of Wardian cases in the wards of hospitals generally for the pleasure which they afford to the sick. He then proceeds to show how the qualities of *correct observation* and *accurate discrimination*, so essential to the practitioner, are encouraged by the study of botany, and speaks in warm terms of the advantages of his favourite science as a recreation. He concludes his lecture by drawing attention to the evidences of *design* afforded by the study of botany, and encourages his hearers to aim at being useful to their fellow creatures.

Dr. Carter. An Account of the Calculi contained in the Grant Medical College Museum, with some general Remarks on Calculi in India.

In the college there are 119 urinary calculi from man, but very few biliary calculi. The *oxalate of lime calculi* amount to 38·65 per cent., while in the College of Surgeons these reach only to 14·75 per cent., in Guy's Hospital to 22·59 per cent., and in the Norwich Hospital to 13·27 per cent. *Uric acid calculi* are in smaller proportion than in England, and *phosphatic calculi* only reach 3·36 per cent. These amount to 10 per cent. in England *Oxalate of lime forms the nucleus* of calculi twice as frequently in India as in England; the author discusses the causes which may contribute to produce this result.

Samuel Cartwright, F.R.C.S. Inaugural Address, delivered at the opening of the London School of Dental Surgery.

The author alludes to the great importance to the student of a regular scheme of education, and offers some remarks upon the great advantages which will accrue to the profession from the connection with the College of Surgeons. He shows that dental surgery has always been a department of surgery, and holds that a knowledge of surgery and of the medical sciences generally is absolutely necessary for every one who practises as a dentist. The dental hospital will afford opportunities for communicating knowledge not now possessed. The author concludes his address by advising his hearers to make themselves acquainted with the collateral branches of science, and with general literature, to gain an intimate acquaintance with anatomy and physiology, and a knowledge of the principles of surgery; and he earnestly counsels them to look upon their calling as a profession and to uphold it as such.

Dr. Bond. On the Pathology of Chorea.

The author considers that the nervous system of choreic patients is constantly generating an excess of nervous force, the tendency of which to escape by emotional action is less under the control of the will than in healthy persons. He shows that irritation of the peripheral extremeties of the nerves may excite these and other nervous affections, and alludes to the importance of removing these. He advocates a nutritious diet, the cold douche, and draws attention to the importance of the psychological treatment of the disease—to endeavour to arouse the dormant power of the will, and to withdraw the attention from the abnormal movements. He strongly advocates the importance of gymnastic exercises, and holds that a gymnasium ought to be an essential part of every well-furnished hospital.

A. W. Page, M.D., Oxon. Oratio ex Harveii instituto in œdibus Collegii regalis Medicorum Londinensis habita, Junii xxviii, MDCCCLX.

The orator defends the use of the Latin language, and hopes that the custom of delivering the oration in Latin will be retained. He adverts to the Fellows of the College who have lately deceased—Chambers, Bright, Blackall, and Todd. With regard to the altered system of treating various cases of disease, the orator remarks that for some years past practitioners have found it necessary to lay aside more and more the use of the lancet, cupping glasses and leeches, and administer wine and support in cases in which it was the custom to deplete very largely.

Professor Bloxam. On the application of Electrolysis to the detection of the poisonous metals in mixtures containing Organic Matters.

By electrolysis the author was enabled to detect even the $\frac{1}{100000}$th grn. of arsenious acid, in an organic mixture, with the greatest certainty. The plan is more valuable for detecting antimony, and the latter substance is not so likely to be mistaken for arsenic as in the ordinary methods of testing.

Dr. John Struther's Anatomical and Physiological Observations (*continued*).

XVII. On Jugular Venesection in Asphyxia.

The author recommends that, in cases of asphyxia from drowning, the jugular vein should be opened about an inch above the clavicle as early as possible, and that as soon as the active flow of blood ceases, the wound should be closed and artificial respiration commenced. Blood regurgitates through the valves from the over-distended auricle. If the blood does not flow with moderate freedom, the author thinks it may be desirable to introduce a probe or blowpipe, or instrument like a female catheter, and pass it in gently for the distance of a couple of inches.

XVIII. Demonstration of the use of the round Ligament of the Hip Joint.

The mode of dissection required to expose the ligament and its uses are recorded. The paper is illustrated with views of the ligament in the different movements of the joint.

E. L. Hussey, F.R.C.S. On the Epidemic Small-pox in Oxford, in 1854–5.

The population of Oxford may be estimated at 27,000. More than 4,000 persons, or 1 in 6 were attacked with small-pox. The deaths exceeded 100. The author alludes to the habitual neglect of vaccination among the poor. Of 32 fatal cases, 24 had never been vaccinated, 4 probably not, and 4 only exhibited marks of vaccination.

Plate IV.

To Illustrate Mr. Lee's Remarks on Trephining in Syphilitic Diseases of the Bones of the Skull, (p. 78). *From Drawings by Dr. Westmacott.*

Head and face of girl showing the exposed and necrosed portion of frontal bone; an unhealthy ulcer under the chin and the lobe of the ear, a portion of which has been removed by ulceration.

a. The internal surface of the portion of the frontal bone removed by the trephine.

Plate V.

To Illustrate Mr. Lee's Remarks on Trephining in Syphilitic Disease of the Bones of the Skull, (p. 81). *From a Drawing by Dr. Westmacott. Necrosed Skull seen from within.*

a. Necrosed portion of inner table of skull, the outer table not being affected in the same way.

b. Openings left by removal of portions of the skull partially closed by membrane.

Plate VI.

To Illustrate Dr. Ogle's Remarks on False Membranes in connection with the immediate coverings of the Brain (p. 90).

False Membranes of variable thickness lining the cerebral dura-mater.

a. a. The dura-mater.

b b. The falx cerebri.

c. c. c. Layers of false membrane capable of being subdivided by splitting.

d. d. Veins passing into the superior longitudinal sinus thickened and covered by false membrane.

Plate VII.

Outline of the Male Chest to Illustrate the Physical signs in the case of 'Charles Rome' (p. 92). *Also Dr. Beale's Remarks on a simple and accurate Method of Recording Physical Signs* (p. 97).

Fig. 2. Second rib. Fig. 3. Third rib. *a.* Shows the limit of the dulness from January 20th to February 3rd. *b.* Limit of dulness on February 4th. *c.* On the 6th The dots in the space *d* indicate the points at which the rubbing sound was heard on the 24th; over the entire space *d* on the 26th.

Plate VIII.

Outlines of a Female Chest to Illustrate Dr. Beale's Remarks on a simple and accurate Method of recording Physical Signs (p. 97).

Plate IX.

To Illustrate Dr. Martyn's Remarks on Connective Tissue (p. 99).

Fig. 1. Transverse section of adult human tendo Achillis, half dried, magnified 300 diameters. Stellate bodies are seen, some of them with corpuscles in the centre, some with communicating radii. They are really spaces between the ultimate bundles. Between them are seen the cut across elastic fibres.

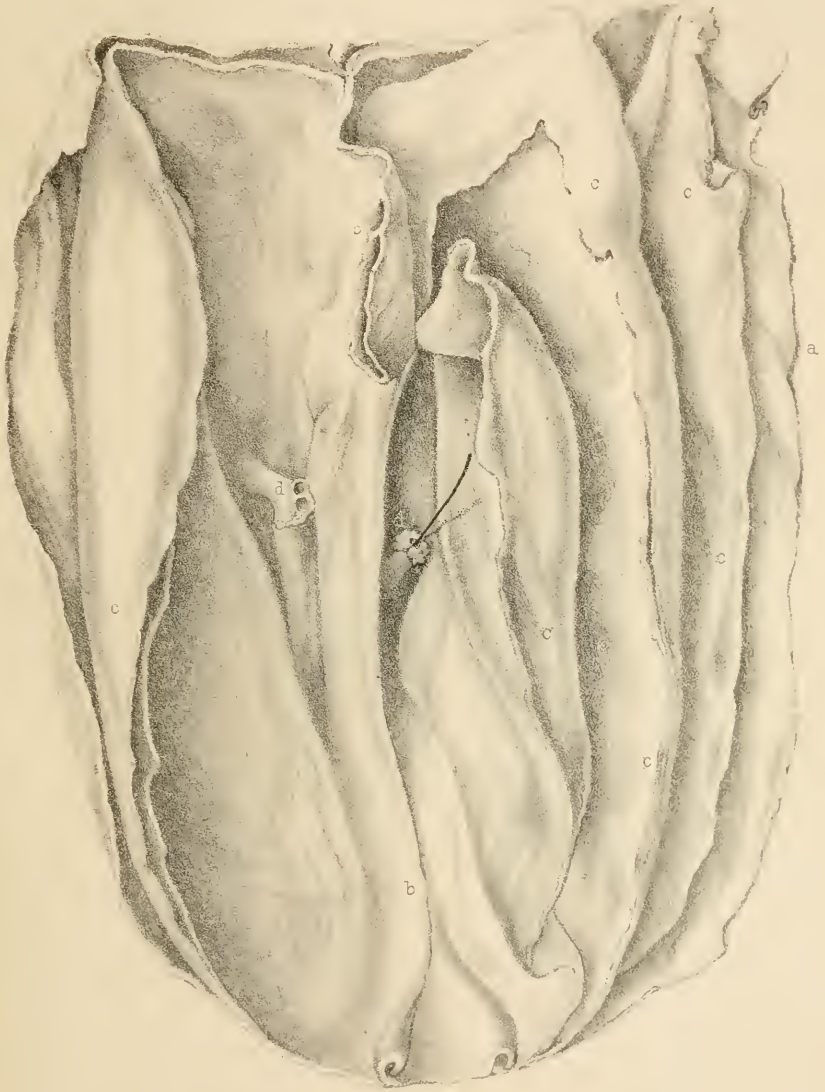
Fig. 2. Longitudinal section of tendo Achillis, from infant at birth; half dried, and treated with dilute acetic acid. The cells of connective tissue are seen to become, and give origin to, the true nuclear fibres, or young elastic tissue. The cells do not send off transverse runners. In adult tendon the cell and nucleus appear more as a thickened part of the fibre. Magnified 300 times.

Fig. 3. The same object as in fig. 1, treated with dilute acetic acid. The star-shaped forms have disappeared, and the cells are seen to have pieces of elastic fibre attached to them corresponding to the thickness of the section. The preparation is disturbed by swelling up, and its edge shows the appearances of fig. 2.

Fig. 4. Cells in a frond of porphyra, showing that what is called *inter*cellular substance is really resolvable into layers or laminated "mother cells." The degree of lamination is in proportion to the development of the group.

Fig. 5. Compound capsular matrix of hyaline cartilage (cricoid of lamb). The old capsule of the large group has pushed outwards the granular remains of still older capsules. Magnified 300 diameters.

Fig. 6. A diagram to illustrate the cell growth in figs. 4 and 5. If the cells a, b, and c happen to be under observation, b will appear to be separated from c by intercellular matrix, while its capsule (cellular wall) is in contact with that of a. [The older capsules blend more and more, and are pressed into receding angles between the spheroidal groups, as they become dilated.]



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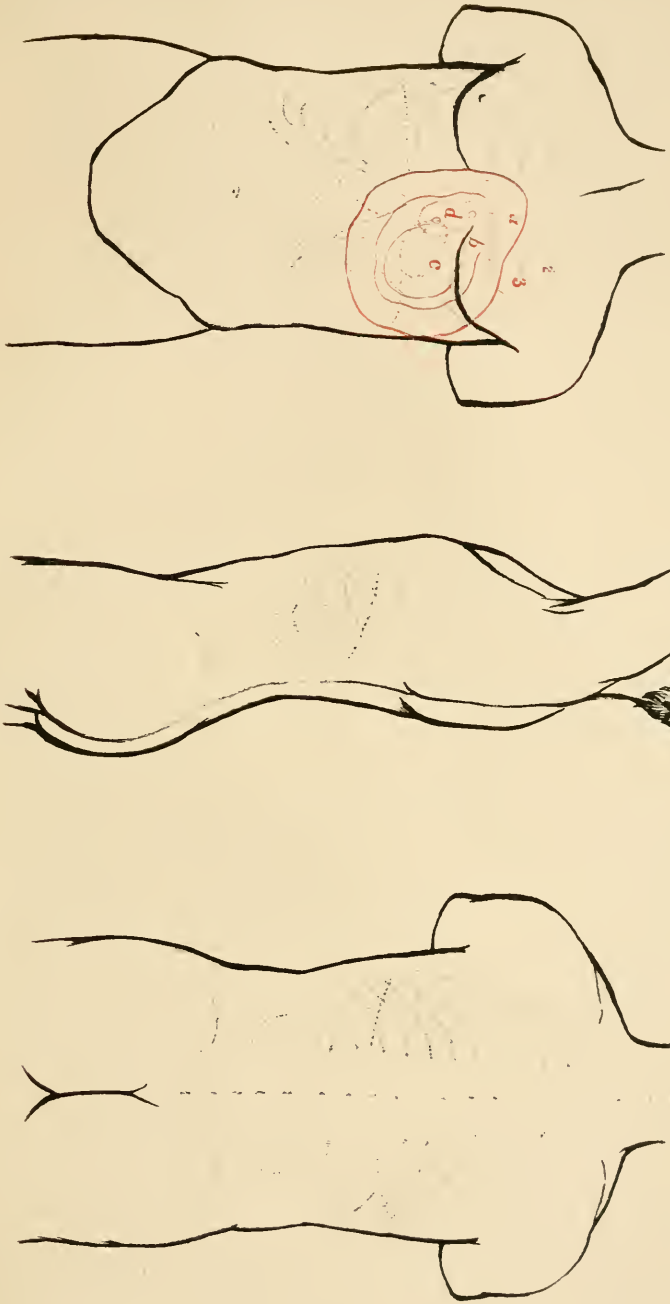
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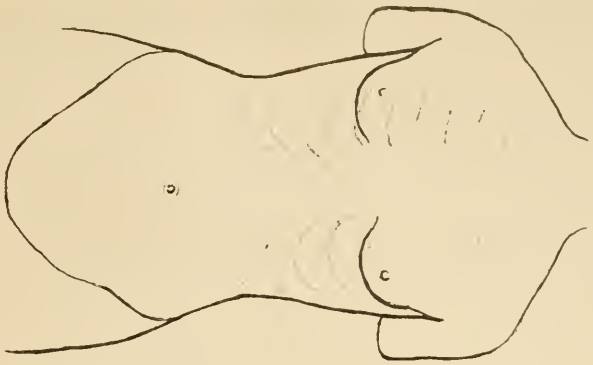


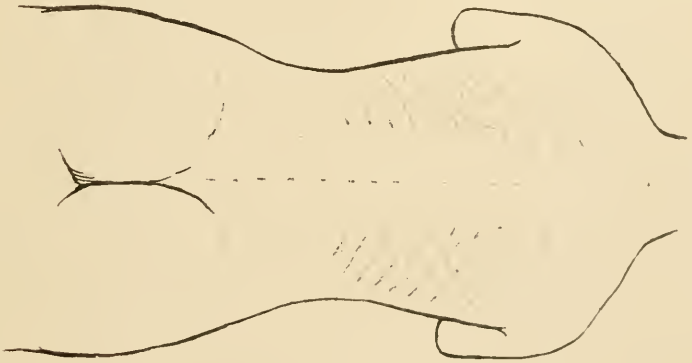


Fig 1

Fig 2

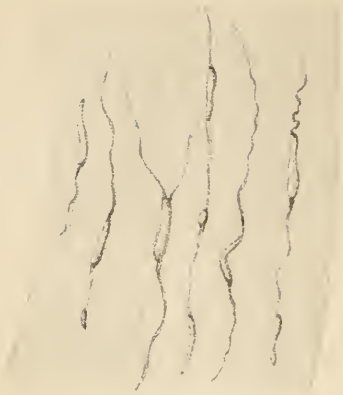


Fig 3

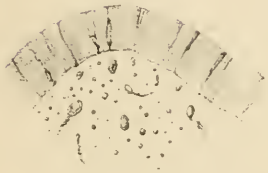


Fig 4

Fig 5

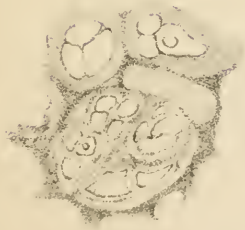
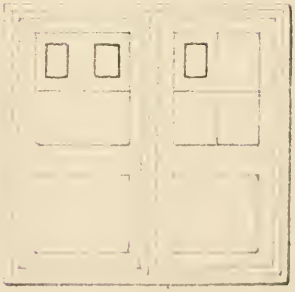


Fig 6.



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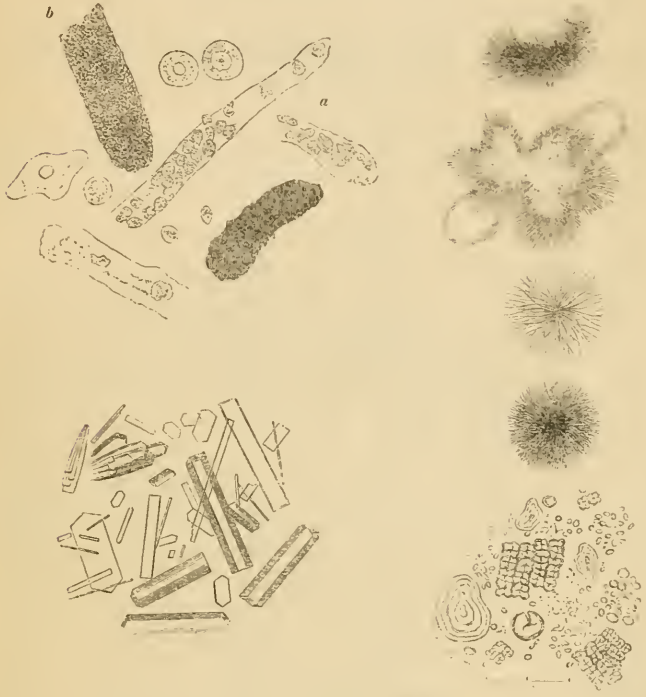

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PROSPECTUS

OF

KING'S COLLEGE, LONDON.

NOVEMBER 16, 1860.

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Rev. A. S. Thelwall, M.A. . . .	Lecturer in "Public Reading."

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CÆSAR.—"De Bello Gallico." Three Books.
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Matriculation Fee, including Library	£3 3 0
Cap and Gown	1 10 0
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Lent Term, from about the 20th of January to the week before Easter.

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		Fees per Term. £ *s.* *d.*	Per Year. £ *s.* *d.*
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Vocal Music	John Hullah, Esq.	1 1 0	2 12 6
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The instruction given varies according to the proficiency of each Student; but all Students of this Class are required to attend the Chaplain's Lecture on Thursday and Saturday.

Hours of attendance, from ten to two daily.

The Fees amount to £8 8*s.* per Term, which sum covers every expense, except the Entrance Fees, which are £4 15*s.* 6*d.*, as in the Theological Department. Upon joining that Department, the Student will not have to pay the Entrance Fees again.

N.B. The next day fixed for the admission of new Students, is Tuesday, January 22, 1861.

KING'S COLLEGE, LONDON.

Department of General Literature and Science.

This Department is intended to prepare Students for the Universities, for Holy Orders, for the Bar and other professions, and for competition for appointments in the Civil Service of her Majesty's Government, and of the Honourable East India Company.

The regular Course of Education comprises—

Religious Instruction, according to the principles of the United Church of England and Ireland, by the Rev. R. W. Jelf, D.D. Principal, and the Rev. E. H. Plumptre, M.A. late Fellow of Brasenose College, Oxford.

The Greek and Latin Classics, by the Rev. R. W. Browne, M.A. late Fellow and Tutor of St. John's College, Oxford, Professor; C. H. O. Daniel, Esq. B.A. Scholar of Worcester College, Oxford, Lecturer; and the Rev. J. J. Heywood, M.A. of Trinity College, Cambridge, Assistant Lecturer.

Mathematics, by the Rev. T. G. Hall, M.A. late Fellow and Tutor of Magdalene College, Cambridge, Professor; the Rev. T. A. Cock, M.A. of Trinity College, Cambridge, Lecturer; and Rev. W. Howse, M.A. of St. John's College, Cambridge, Assistant Lecturer.

Modern History, by C. H. Pearson, Esq. M.A. Fellow of Oriel College, Oxford, Professor.

The English Language and Literature, Composition, &c. by the Rev. J. S. Brewer, M.A. of Queen's College, Oxford, Professor.

French Literature and Language, by Alphonse Mariette, M.A. Professor, and Léonce Stievenard, Lecturer.

German Literature and Language, by Adolphus Bernays, Ph.D. Professor.

The Fees for Matriculated Students, *i. e.* for those who are admitted to the regular and prescribed course of Study, amount to 11*l.* 5*s.* per term. The Fees for the first two terms are paid upon Matriculation, in addition to the following:—

£3	3	0	..... Matriculation, including Library Subscription.
1	10	0	..... Cap and Gown.
0	2	6	..... The Calendar.
£4	15	6	

Previously to Matriculation, Students are required to produce a testimonial of good conduct from their last instructor, and to subscribe a declaration, that they will conform to all the Rules and Regulations of the College.

Except in special cases, no one is admitted under sixteen years of age.

Chapel.—The duties of the day commence with Prayers in the Chapel, at Ten o'Clock precisely. The presence of all Matriculated Students is required. A register of their attendance is kept.

The Academical Year consists of *Three Terms*; viz. *Michaelmas Term*, from the beginning of October to the week before Christmas; *Lent Term*, from the middle of January to the week before Easter; *Easter Term*, from Easter to the beginning of July.

Examinations.—There are Examinations at the end of the Michaelmas and Easter Terms when the Students are classed according to their proficiency. The Examination at the close of the Academical Year is followed by a public Distribution of Prizes.

SCHOLARSHIPS. The following are given every year in this Department:—

One of £50 every year, in Modern History. } See next page.
One of £50 „ in English Literature. }
One of £40 „ in Classics, and one of £40 in Mathematics, for two years.
One of £30 „ „ and one of £30 in ditto.
One of £20 „ „ and one of £20 in ditto.
One of £30 „ in Divinity, (open to other Departments).

Students who have pursued their Studies in this Department of the College for three years, and have fulfilled the required conditions, are entitled, under rules laid down in the Calendar, to the Diploma of "Associate of King's College." This privilege is also extended to all Students who have passed through a Course of *two* years' study at the College, if they have previously passed *two* years either in King's College School, or in one of the Schools in Union, and had passed at least one term in the highest form of that School before leaving it.

Students of this Department, who have obtained the Diploma of "Associate of King's College," are entitled to enter the Theological Department, with the view of becoming Candidates for Holy Orders.

Dinner is provided in the College Hall every day at 6 o'clock for such Students as may wish to avail themselves of that accommodation.

Residence of Students.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. The Censor of the College lives within its walls, and to him is committed by the Council the superintendence of all resident Students under academical discipline. See page 21.

Some of the Professors, &c. receive Pupils into their houses. See p. 22.

The different Classes in this Department are likewise open to Gentlemen who, being unable to attend the whole course, may wish for the opportunity of studying any particular subject. The following are the Fees for admission to separate Courses:—

		Term. £ s. d.	Per Ann. £ s. d.
Classical Literature	Profes. Rev. R. W. Browne	4 4 0	10 10 0
Mathematics	Profes. Rev. T. G. Hall	4 4 0	10 10 0
Modern History	Profes. C. H. Pearson	2 2 0	5 5 0
English Language, Composition, &c.	Prof. Rev. J. S. Brewer	2 2 0	5 5 0
Hebrew Language	Profes. Rev. A. M'Caul, D.D.	2 2 0	5 5 0
Sanscrit, &c.	Profes. D. Forbes	4 4 0	—
Modern Greek	G. W. Leitner, Esq.	4 4 0	10 10 0
Turkish	G. W. Leitner, Esq.	4 4 0	10 10 0
Arabic	G. W. Leitner, Esq.	4 4 0	10 10 0
French Language	Profes. Mariette	2 2 0	5 5 0
German Language	Profes. Bernays	2 2 0	5 5 0
Italian Language	Profes. Pistrucci	2 2 0	5 5 0
Spanish Language		2 2 0	5 5 0
Chinese Language	Profes. Summers	5 5 0	—
Drawing and Perspective	Professor De La Motte	2 2 0* / 4 4 0†	5 5 0* / 10 10 0†
Law	Professor Stephen		
Library Fee		—	1 1 0

* For Matriculated Students. † For Occasional Students.

HOURS OF ATTENDANCE.

The duties of the day commence with prayers in the Chapel at Ten o'clock precisely, when the attendance of all Students is required.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Classics / Mathematics	10¼...1	10¼...1	10¼...1	10¼...1	10¼...1	—
Divinity	—	—	1½...2	—	—	10½...12½
English Language	1½...3½	1½...3½	—	1½...3½	1½...3½	—
Modern History	1½...3½	1½...3½	—	1½...3½	1½...3½	—
French	3½...4¾	—	—	3½...4¾	—	—
German	—	3½...4¾	—	—	3½...4¾	—
Hebrew	—	—	3...4	3...4	—	—
Italian	9...10	—	—	9...10	—	—
Chinese	—	3½...5	3½...5	—	3½...5	—
Modern Greek	—	3...4	—	3...4	—	—
Turkish	—	4...5	—	4...5	—	—
Arabic	—	5½...6½	—	5½...6½	—	—
Fencing	2...4	—	—	—	—	—
Landscape Drawing	8½...10	—	—	8½...10	—	—

N.B. The next day fixed for the admission of new Students, is Tuesday, January 22, 1861.

KING'S COLLEGE, LONDON.

Department of General Instruction in the Applied Sciences.

I.—ENGINEERING SECTION.

INCLUDING ENGINEERING, PRACTICAL SURVEYING AND LEVELLING, MANUFACTURING ART AND MACHINERY, &c.

The object of this Section is to provide a system of general instruction, essentially practical in its nature, for the large and important class of young men hereafter to be engaged in Civil and Military Engineering, Surveying, Architecture, and the higher branches of Manufacturing Art.

The whole course thus occupies three years, and forms an appropriate introduction to that kind of instruction which can only be obtained within the walls of the manufactory, or by actually taking part in the labours of the Surveyor, the Engineer, or the Architect.

Museums, containing important and valuable collections, illustrating the subjects taught, are open to the Students.

Students who have passed two years in this Department, and, in addition, not less than one year in practice under a Civil or Mechanical Engineer, are, by a special order of the Secretary of State for India in Council, admitted to be Candidates for appointments to the Engineer Establishment in India.

The course of instruction comprises those branches of knowledge which form the groundwork of a liberal education. The following are the subjects taught in this Section:—

RELIGIOUS INSTRUCTION,

According to the principles of the United Church of England and Ireland, by the Chaplain, the Rev. E. H. Plumptre, M.A. late Fellow of Brasenose College, Oxford.

MATHEMATICS.

Professor—Rev. T. G. Hall, M.A.

Lecturers—Rev. T. A. Cock, M.A., and Rev. W. Howse, M.A.

First Year.—Arithmetic; Algebra; Euclid, Books I, 2, 3, 4, 6, 11; Plane Trigonometry and Logarithms.

Second Year.—Conic Sections; application of Algebra to Geometry; the Differential and Integral Calculus.

Third Year.—Spherical Trigonometry; Geometry of three dimensions; Differential Calculus.

NATURAL PHILOSOPHY AND ASTRONOMY.

Professor—James Clerk Maxwell, Esq. M.A.

The object of these Lectures is to teach the principal Mechanical Sciences—namely, Statics, Dynamics, Hydrostatics, Pneumatics, and Hydraulics, together with Optics and Astronomy.

The instruction given in the first year requires no mathematical knowledge on the part of the Student, the method of solving problems by Construction being adopted.

In the second and third years the Mathematical principles of Mechanics, Hydrostatics, Optics, and Astronomy are taught, including the Theory of Work, the Mathematical Calculations relating to Roofs, Arches, Chain Bridges, Embankments, Strength of Materials, &c. together with the Constructions and use of Optical and Astronomical Instruments.

CHEMISTRY.

Professor of Chemistry—W. A. Miller, M.D. F.R.S.

Professor of Practical Chemistry—C. L. Bloxam, Esq.

Demonstrator—E. A. Hadow, Esq.

Students of the First and Second Years are admitted to the Course of Theoretical and Applied Chemistry. The Course commences with a View of the Forces which concur

to the production of Chemical Phenomena, after which the laws of Chemical Affinity are discussed, and the Non-metallic Elements and their principal Compounds are described.

The Metals and their principal compounds are next examined, care being taken to point out the applications of the Science to the Arts; and the processes of the different Manufactures, of Metallurgy, and of Domestic Economy, are explained and illustrated.

Examinations of the Class, both *vivâ voce* and by written papers, are held at intervals during the course at the usual Lecture hour. Dr. Miller has published a work on Chemistry, which is used as a text-book by the Class.

THIRD YEAR.—Students who have completed six Terms in this Department are admitted to a Course of "Practical Chemistry," consisting of Twelve Demonstrations in each term; and they go through a course of Manipulation in the most important operations of Chemistry, including the first steps of Analysis.

Any Student of this Department may be admitted to this Class at any period of his study, on payment of an extra fee. See p. 12.

EXPERIMENTAL AND ANALYTICAL CHEMISTRY IN THE LABORATORY.—The object of this Class is to afford to Students who are desirous of acquiring a knowledge of analysis, or of prosecuting original research, an opportunity of doing so under the superintendence of the Professor and Demonstrator; Students may enter, upon payment of the extra Fees, at any time except during the vacation, and for a period of one, three, six or nine months, as may best suit their convenience. The laboratory hours are from ten till four daily, except Saturday, on which day the hours are from ten till one.

In addition to the Laboratory Fee, each Student defrays the expenses of his own Experiments. The amount of this expense, which is comparatively trifling, is entirely under his own control.

GEOLOGY.

PROFESSOR—JAMES TENNANT, ESQ. F.G.S.

LENT TERM.—Descriptive Geology.

EASTER TERM.—The practical application of Geology to Engineering, Architecture, Agriculture, and Mining.

The Students are accompanied by the Professor to the Museum of Economic Geology, the British Museum, and other public institutions, and also on excursions into the country.

ARTS OF CONSTRUCTION IN CONNEXION WITH CIVIL ENGINEERING AND ARCHITECTURE.

PROFESSOR—W. HOSKING, ESQ.; LECTURER—ANDREW MOSELEY, ESQ.

This Course, intended for Students of the second and third years, includes a descriptive account of the various Arts and Operations employed in Hydraulic Architecture or Engineering, and also of those employed in the ordinary practice of Civil Architecture;—Navigators', Bricklayers', Masons', Carpenters', Smiths' Work, &c.;—the matters acted upon,—the terms used,—the tools, implements, and materials employed, and the modes of operating with or upon them;—the combinations effected, and the modes of effecting them in detail:—Cutting and Embanking,—the Formation and Construction of Drains and Sewers, Shafts, Driftways, Tunnels, Canals, Reservoirs, Water Works, Roads, Bridges, Railways, Docks, Harbours, &c. &c.

The Course will also include Instruction in Specifying, Estimating, and Measuring Work, and in the practice of Architectural Surveying generally.

Any Student of this Department may be admitted to this class at any period of his study, on payment of the usual fee.

MANUFACTURING ART & MACHINERY.

PROFESSOR—C. P. B. SHELLEY, ESQ.

The Lectures and Instructions in this section are intended to familiarize the student with the Machinery and contrivances in actual use; thus adding a knowledge of practice to the knowledge of theory taught by the Professors.

To effect this object, machines are not only described in general terms, but their various details, and the design of each particular construction, are explained and illustrated by drawings or models.

The most important manufacturing processes are also explained and amply illustrated in the course.

VISITS OF THE STUDENTS TO MANUFACTORIES, ETC.

Access to some of the principal Manufacturing Establishments in the metropolis, and its vicinity, having been liberally granted to the Students of this department of King's College, they are accustomed to visit them from time to time, accompanied by the Professor on Manufacturing Art and Machinery: they thus see in operation the manufacturing processes which have formed the subject of their Lectures, the mechanical expedients which concur to the production of each are explained, and the economy of the whole is pointed out on the spot.

ENGINEERING WORKSHOPS.

SUPERINTENDENT—G. A. TIMME, ESQ.

Workshops have been fitted up, with engines, lathes, forges, benches, and all necessary implements for enabling the Students to become practically familiar with the Use of Tools, and the Construction of Models. At certain hours the Students are admitted, and a regular course of instruction is given, beginning with the simplest kinds of work and gradually proceeding to the construction of models of Apparatus and Machinery.

In addition to the Superintendent, experienced workmen are in attendance at regular hours.

GEOMETRICAL DRAWING AND DESCRIPTIVE GEOMETRY.

PROFESSOR—THOMAS BRADLEY, ESQ.

LECTURER—FREDERICK ALFRED BRADLEY, ESQ.

This Course comprehends Practical Geometry in the most extensive sense of the term.

1. PLANE GEOMETRY, the delineation of plane figures and curves, and, generally, the solution of all the Problems required in the practical Arts; the use of Drawing Instruments, &c.

2. SOLID, or DESCRIPTIVE GEOMETRY, including PROJECTION, ISOMETRICAL PROJECTION, PERSPECTIVE, the construction of MAPS, LIGHT and SHADE, and DRAWING, in the common acceptation of the term, as connected with the objects of this Department.

LANDSCAPE DRAWING AND COLOURING, AS APPLIED TO ARCHITECTURAL DESIGNS.

PROFESSOR—PHILIP H. DE LA MOTTE, ESQ. F.S.A.

This Class is limited to Students of the third year, who have the option of attending it *instead* of Geometrical Drawing.

MINERALOGY.

PROFESSOR—JAMES TENNANT, ESQ. F.G.S.

The Course commences with a description of the Physical and Chemical characters of Minerals in general.

The principal simple Minerals are next separately considered, and the readiest mode of distinguishing them described.

The course of instruction includes a minute description of all the substances entering into the composition of Rocks, and of those minerals which are also used in the Arts; illustrated by an extensive collection of characteristic specimens, and diagrams of the principal crystalline forms, &c.

PRACTICAL SURVEYING AND LEVELLING.

LECTURER—HENRY JAMES CASTLE, ESQ.

This Course is at once theoretical and practical: in the College, it embraces the various in-door details of a Surveyor's Office; and in the field, the uses and application of the several Surveying Instruments which are now in use on *Civil and Military* Surveys in England, India, and the colonies. It also includes the Theory and Practice of Levelling, the making of Sections from the Field-Books, and all the requisite practical detail before getting out the working drawings and letting the contracts; and generally, such information, both theoretical and practical, as will qualify the Student to enter at once as Draughtsman into an Engineer's Office.

THE ART AND SCIENTIFIC PRINCIPLES OF PHOTOGRAPHY.

LECTURER—THOMAS FREDERICK HARDWICH, ESQ.

Arrangements are now made for a complete Course of Instruction in Photography in King's College. A glass house, with commodious developing rooms, has been erected, and in connexion with it a Laboratory for the preparation of Photographic Chemicals. Students entering to this Department will be afforded every facility for practising the Art in all its branches.

In addition to the regular College Course in Photography, occasional Classes are formed, consisting each of about six gentlemen, who meet twice a week. Ten Lectures are given of two hours each, for which the fee is £3 3*s*., to be paid in the Office of the College. The fee for Private Instruction is £5 5*s*. for six Lessons, or £10 10*s*. for perpetual attendance.

THE ADMISSION OF STUDENTS.

Previously to Matriculation, Students are required to produce a testimonial of good conduct from their last instructor, and to subscribe a declaration, that they will conform to all the Rules and Regulations of the College. Every Student, after obtaining the signature of the Principal to his card of admission, is required to bring it to Professor HALL, the Dean of this Department, in order that it may be countersigned by him.

CHAPEL.—All Matriculated Students are required to attend Prayers in the Chapel at 10 o'clock precisely. A register of their attendance is kept.

The Academical Year consists of *Three Terms;* viz. *Michaelmas Term*, from the beginning of October to the week before Christmas; *Lent Term*, from the middle of January to the week before Easter; *Easter Term*, from Easter to the beginning of July.

EXAMINATIONS.—One at the end of the Michaelmas Term and another at the close of the Academical Year, at which latter there is a public Distribution of Prizes.

AGE OF ADMISSION.—Except in special cases, no one is admitted under sixteen years of age

RESIDENCE OF STUDENTS.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. The Censor of the College lives within its walls, and to him is committed by the Council the superintendence of all resident Students under academical discipline. See page 21.

Some of the Professors, &c. receive Pupils into their houses. See page 22.

FEES.

The Fees payable by Matriculated Students, that is, by those who are admitted to the Regular and Prescribed Course of Study, amount to £12 17*s.* per Term. The Fees for the first two Terms must be paid upon entrance, in addition to the following:—

Matriculation Fee, including Library Subscription	£3 3 0
Cap and Gown	1 10 0
Calendar	0 2 6
	£4 15 6

The different Classes in this Department are open to any Gentlemen who may not wish to attend the whole of the Course, but who may desire to study any particular subject. The following are the Fees:—

	£ *s.* *d.*	£ *s.* *d.*
Mathematics	4 4 0 per Term	10 10 0 per Annum.
Natural Philosophy	3 3 0 ...ditto	8 8 0 ditto.
Chemistry	3 3 0 ...ditto	7 7 0 for the Year.
Practical Chemistry	1 11 6* / 2 2 0‖ for Terminal Course of 12 demonstrations.	
	4 4 0§ / 5 5 0‖ for Summer Course of 30 demonstrations.	
	8 8 0§ / 9 9 0‖ for perpetual attendance.	
Experimental and Analytical Chemistry	4 4 0 One Month.	
	10 10 0 Three Months.	
	18 18 0 Six months.	
	26 5 0 Nine Months.	
Descriptive Geology	2 12 6 for the Lent Term,	3 13 for the two Terms.
Practical Geology and Mining	1 11 6 for the Easter Term, or	
Arts of Construction, &c.	2 12 6 per Term	7 7 0 per Annum.
Landscape Drawing	2 2 0§ / 4 4 0‖ ditto	5 5 0§ / 10 10 0‖ ditto.
Mineralogy		2 2 0 for the Course.
Geometrical Drawing	2 2 0 per Term	5 5 0 per Annum.
Manufacturing Art and Machinery	2 2 0 .....ditto	5 5 0 ditto.
Practical Surveying	3 3 0 .....ditto	8 8 0 ditto.
Workshop†	3 3 0 .....ditto	8 8 0 ditto.
Photography	3 3 0 for Ten Lessons.	

* For Students of this Department who have not kept six Terms.
§ For Matriculated Students of other Departments. ‖ For Occasional Students.
A Fee of 14*s.* per Term is also required for the use of the Steam-engine and Machinery.

DAYS AND HOURS OF ATTENDANCE.

The duties of the day commence with prayers in the Chapel at Ten o'clock precisely, when the attendance of all Students is required.

FIRST YEAR.	*Monday.*	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*	*Saturday.*
Chemistry	—	10.15—11.15	—	—	10.15—11.15	—
Mathematics	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	—
Mechanics and Nat. Phil.	10.15—1	—	10.15—1	10.15—1	—	—
Drawing	—	—	*a*1—4	—	1—4	—
Surveying	—	—	—	—	*e*3—4	*e*10
Mach. and Man. Art	—	—	—	1.15—2.15	—	—
Ditto, Visit	—	—	*b*1—4	—	—	—
Mineralogy (*c*)	—	—	9—10	—	9—10	—
Geology (*d*)	—	—	9—10	—	9—10	—
Practical Geology (*e*)	—	—	9—10	—	9—10	—
Workshop (*h*)	1—4	1—4	—	—	—	—
Divinity	—	—	—	2.30—3.15	—	11
SECOND YEAR.						
Chemistry	—	10.15—11.15	—	—	10.15—11.15	—
Mathematics	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	—
Mechanics	10.15—1	—	10.15—1	10.15—1	—	—
Drawing	1—4	—	*a*1—4	—	—	—
Surveying	—	—	—	—	*f*4—5	*g*10
Mach. and Man. Art. (*o*)	—	1.15—2.15	—	—	—	—
Ditto, Visit	—	—	*b*1—4	—	—	—
Mineralogy (*c*)	—	—	9—10	—	9—10	—
Geology (*d*)	—	—	9—10	—	9—10	—
Practical Geology (*e*)	—	—	9—10	—	9—10	—
Arts of Construction (*m*)	—	4—5	—	3.30—4.30	—	—
Workshop (*h*)	—	1—4	—	—	1—4	*g* 10.15—1
Divinity	—	—	—	2.30—3.15	—	11
THIRD YEAR. *Extra Subjects.*						
Practical Chemistry (*i n*)	10.30—12.30	—	—	—	—	—
Photography (*k n*)	—	—	—	—	10.30—12.30	—
Surveying	—	—	—	—	*f*3—4	*p*10

As to other Classes, similar in all respects to Second Year Students.

a b. Alternate Wednesdays.
c. Michaelmas Term only.
d. Lent Term only.
e. Easter Term only.
f. Michaelmas and Lent Terms only.
g. On alternate Saturdays in Surveying during the Michaelmas and Lent Terms only.
h. Open from 1 to 6 daily (Saturday excepted, when it closes at 4), for such Students as have leisure for attending; but attendance required, and marked, at the hours named.
i. Twelve Lessons every Term.
k. Six Lessons every Term.
m. Open to Students of the First Year on payment of the usual fee.
n. Open to Students of the Second Year on payment of the usual fee, and by leave of the Dean.
o. Students not attending this Class on Tuesday, are to attend the Workshop from 1 to 4, and must also attend the lecture on machinery, at 1.15. on Thursday.
p. On alternate Saturdays in Levelling during the Michaelmas and Lent Terms only.

ENDOWMENTS, PRIZES, &c.

SCHOLARSHIPS.—One of £30, two of £25, and one of £20, tenable for one year.
The Divinity Scholarship of £30.
The Daniels' Scholarship of £20. (See page 18.)

PRIZES, Certificates of Approval, and Certificates of Honour, are given to those Students who most distinguish themselves at the Examinations held in June.

ASSOCIATES, &c.—Students who have pursued their Studies in this Department for Nine Terms, and who have fulfilled the conditions mentioned in the Calendar, are entitled to the Diploma of "Associate of King's College."

MILITARY SECTION.

This Section of the Applied Sciences Department is intended—

A. For those Gentlemen intending, (1) to compete in the Examinations for admission into the Royal Military Academy at Woolwich; the Royal Military College at Addiscombe; or the Royal Military College at Sandhurst: (2) or to pass the Examination for Commissions in the Service of Her Majesty, either in England or in the East Indies.

B. For Officers wishing to prepare themselves for the Examination for Staff Appointments, or to compete for admission into the Royal Military College at Sandhurst.

The different Classes are conducted by the following Professors and Lecturers:—

Religious Instruction, according to the principles of the United Church of England and Ireland, by the Rev. E. H. Plumptre, M.A. Chaplain.

Mathematics, by the Rev. T. G. Hall, M.A. Professor, the Rev. T. A. Cock, M.A. Lecturer, and the Rev. W. Howse, M.A. Assistant Lecturer.

Chemistry, by Professor W. A. Miller, M.D. Professor.

Natural Philosophy, by J. C. Maxwell, Esq. M.A. Professor.

Mineralogy and Geology, by James Tennant, Esq. Professor.

Geometrical Drawing, by Frederick Alfred Bradley, Esq. Lecturer.

Topographical Drawing; Fortification; Military Surveying; Military Law; the Science of Artillery, by Major Griffiths, R.A. Professor.

French, by Professor Mariette, M.A. Professor, and M. Stievenard, Lecturer.

Military Tutor (for History, Classics, &c.), Rev. J. O'Reilly, M.A.

FEES AND HOURS OF ATTENDANCE.

Fees to Separate Classes per Term.		Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
£ s.							
	Divinity	...	...	...	2.30—3.15	...	...
2 2	Mineralogy and Geology.	...	...	9—10	...	9—10	...
3 3	Chemistry	...	10.15—11.15	...	...	10.15—11.15	...
3 3	Heat and Electricity (Natural Philosophy)	10.15—1	...	10.15—1	10.15—1	...	...
4 4	Mathematics.... Pure / Mixed	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	...
2 2	Geometrical Drawing	1—3	...	1—4	...	1.15—4	...
4 4	Topographical Drawing, Fortification, &c.	...	1.30—3.30	...	...	...	10.15—12.30
8 8	Ditto, for Officers only ...	...	11—3.30	...	...	...	10.15—2.30
2 2	French	3.15—4.45	...	...	3.15—4.45	...	...
4 4	Military Tutor's Class in History, Classics, &c...	...	...	3.15—5	1.15—2.15	2.30—4.30	...

Fees per Term to Matriculated Students, for the Course, including Tutor's Class, 15*l.* 15*s.*; or, exclusive of the Tutor's Class, 13*l.* 13*s.* The Matriculation Fees are 4*l.* 15*s.* 6*d.* on entrance.

Fees for Officers' Class, 8*l.* 8*s.* per Term.

KING'S COLLEGE LONDON.

Medical Department.

The Students received into this Department are—

I. Matriculated Students, or those who (with certain exceptions named in the Calendar) receive their entire medical education at King's College.

Matriculated Students alone have the privilege of filling the offices of Clinical Clerks, Dressers, Dentist's Assistant, Physicians' Assistant, Physician Accoucheur's Assistant, Assistant House Physician, House Surgeon, and Assistant House Surgeon, to the Hospital; of becoming candidates for the Warneford and Medical Scholarships; and of wearing the College cap and gown. They are also admitted to the practice of the Hospital at a somewhat reduced fee.

II. Occasional Students, or those who enter to one or more particular Classes. Every Class is open to such Students, on payment of the prescribed amount of fees.

The year is divided into two Sessions. The Winter Session, beginning October 1st, terminates at the end of March. The Summer Session, beginning May 1, terminates at the end of July.

The Lectures upon the various branches of Medical Knowledge are as follows:—

Winter Session.

ANATOMY, DESCRIPTIVE AND SURGICAL.	*Professor*, Rich. Partridge, F.R.S. *Demonstrator*, J. Wood, F.R.C.S. *Assistant Demonstrators*, W. F. Clarke, Herbert Morgan, John Skrimshire.
PHYSIOLOGY: GENERAL AND MORBID ANATOMY	*Professor*, Lionel Smith Beale, M.B.F.R.S.
CHEMISTRY	*Professor*, W. A. Miller, M.D. F.R.S. *Demonstrator*, E. A. Hadow, Esq.
MEDICINE, PRINCIPLES AND PRACTICE OF	*Professor*, George Budd, M.D. F.R.S.
SURGERY, PRINCIPLES AND PRACTICE OF	*Professor*, William Fergusson, F.R.S.

Summer Session.

BOTANY	*Professor*, Robert Bentley, F.L.S.
MATERIA MEDICA AND THERAPEUTICS	*Professor*, George Johnson, M.D.
MIDWIFERY, AND THE DISEASES OF WOMEN AND CHILDREN	*Professor*, Arthur Farre, M.D. F.R.S.
FORENSIC MEDICINE	*Professor*, W. A. Guy, M.B. F.S.S.
PRACTICAL CHEMISTRY	*Professor*, C. L. Bloxam.
COMPARATIVE ANATOMY	*Professor*, T. Rymer Jones, F.R.S.
DENTAL SURGERY	*Professor*, Samuel Cartwright, jun. F.R.C.S.

Dean for the Year 1860-61 . . . . . PROFESSOR JOHNSON, M.D.

Sub-Dean and Medical Tutor . . . . . JOHN HARLEY, ESQ. M.B.

It is one of the duties of the Medical Tutor to assist the Students living in the College, as well as the non-resident Students, in the subjects of the Lectures of their first Winter and Summer Session.

N.B. By a recent regulation of the College of Surgeons, all candidates for the Diploma of the College, who shall commence their *Professional* Education on or after the 1st of January, 1861, will be required to pass a preliminary examination in the ordinary branches

of a liberal education, or to produce certificates from certain specified institutions of having passed a corresponding examination. For particulars see the Regulations of the Royal College of Surgeons, quoted in the Calendar.

Students who intend to graduate in the University of London are reminded that they will be required to pass the Matriculation Examination of that University at least two years before they can present themselves as candidates for any of its degrees. A certificate of having passed this examination, is admitted by the College of Surgeons and the Apothecaries Hall as a substitute for their own preliminary examinations.

ANALYTICAL AND EXPERIMENTAL CHEMISTRY.

Besides the Course of Chemical Lectures, and the Summer Class of Practical Chemistry, provision is made for those Students who wish to become more minutely acquainted with the practical details of the science. The Class formed for this purpose is conducted in the Laboratory, under the superintendence of the Professors and Demonstrator. By this means each Student will be enabled to familiarize himself with the methods of analysis and research. After passing through a preliminary course of analytical operations, each Student devotes himself to such portions of the science as are most interesting to himself, or most likely to be practically useful to him.

DENTAL SURGERY.

A Course of Lectures on Dental Physiology, Dental Surgery, and Pathology, and on Dental Mechanics, will be given during the Summer Session for those who specially enter for this Course.

Special Certificates of attendance on the Dental Practice of the Hospital will be given on payment of an extra Fee of Five Guineas.

Fees.

The College fees, in the case of *Matriculated* Students, for the lectures required by the College of Surgeons and the Society of Apothecaries, amount to 61*l.* 19*s.*; those for Hospital practice to 31*l.* 10*s.*; those for Matriculation, (including Library Fee, Calendar, and College Cap and Gown,) to 4*l.* 15*s.* 6*d.*; making together 98*l.* 4*s.* 6*d.* This sum will cover all that of necessity *must* be paid for the entire three years' Course of Study.

Students are, however, recommended to add to this sum 2*l.* 2*s.* for a second Course of Chemistry, as well as the Fee for attendance on the Medical Tutor's Class for one year; viz., 2*l.* 2*s.* for resident Students; 3*l.* 3*s.* for non-resident Students. All resident Students are required to attend the Tutor during their first year.

The fees may be paid either in one sum on Matriculation, or in two equal sums; the one at the commencement of the first Winter or Summer Session, the other, after the first Christmas vacation, not later than Jan. 21st, unless other arrangements are made at the time of entrance.

If the plan here suggested is carried out, the following will be the mode of payment.

In October.	First half of the Medical Fees	£32 0 6		
,,	First Half of the Hospital Fees	15 15 0		
,,	Medical Tutor, One Year	3 3 0		
,,	Matriculation Fees	4 15 6		
			55 14 0	
In January.	Second half of Medical Fees	32 0 6		
,,	Second half of Hospital Fees	15 15 0		
			47 15 6	
	Total amount necessary to defray the cost of Lectures required by the College of Surgeons and the Society of Apothecaries, together with a Second Course of Chemistry and the Tutor's Fees for One Year			£103 9 6

Should any one prefer entering at once as a *perpetual Student to every Course of Instruction* given in this Department (except the Laboratories and Dental Surgery) the charge will be as follows:—

In October.	First half of Medical Fees	£38 6 6		
,,	First half of Hospital Fees	15 15 0		
,,	Medical Tutor, One Year	3 3 0		
,,	Matriculation	4 15 6		
			62 0 0	
In January.	Second half of Medical Fees	38 6 6		
,,	Second half of Hospital Fees	15 15 0		
			54 1 6	
	Total amount necessary to defray the cost of entering, as a *Perpetual* Student, to every Course of Instruction given in this Department, except as above.			£116 1 6

The Fees for admission to the Laboratory Class are, for one month, 4*l.* 4*s.*; for three months, 10*l.* 10*s.*; for six months, 18*l.* 18*s.* &c.

Days and Hours of Attendance.

CLASS.	M.	Tu.	W.	Th.	F.	S.	Hours.	Fee for the Sessional Course.	Fee for Unlimited Attendance.
WINTER SESSION.									
Anatomy	—	—	—	—	—	*—	9 — 10 A M.	£6 6 0	£9 9 0
Chemistry	—		—	—		—	10½— 11½	7 7 0	9 9 0
Physiology	—		—	—	—		4 — 5	6 6 0	9 9 0
Medicine		—				—	4 — 5	7 7 0	7 7 0
				—			5 — 6		
Surgery	—		—		—		5 — 6	5 5 0	7 7 0
The Chaplain's Lecture					—		10½— 11		
†Tutor's Class	—	—	—	—	—	—	3 — 4	3 3 0	
SUMMER SESSION.									
Midwifery	—		—	—	—		9 — 10	6 6 0	6 6 0
Comparative Anatomy	—		—		—		12 — 1	3 3 0	4 4 0
Botany	—	—		—	—		12½— 1½	3 3 0	4 4 0
†Practical Chemistry	—	—	—	—	—	—	10½— 12	‡4 4 0	‡8 8 0
Forensic Medicine	—	—	—		—		3 — 4	3 3 0	4 4 0
Materia Medica	—		—	—	—		8 — 9	4 4 0	6 6 0
Morbid Anatomy		—					4 — 5	2 2 0	
Dental Surgery		—			—		9 — 10	6 6 0	8 8 0
†Tutor's Class	—	—	—	—	—		9 — 10	3 3 0	
BOTH SESSIONS.									
Chapel	—	—	—	—	—	—	10		
The Principal's Lecture			—		—		1½— 2		

* Anatomy of the head and Neck. See Reg. of Coll. of Surg. for Dent. Surg.
† Half the Class attends three days alternately. ‡ To Matriculated Students.

King's College Hospital.

Consulting Physicians. — Thos. Watson, M.D. F.R.S.; Robert Ferguson, M.D.

Physicians.
- George Budd, M.D. F.R.S.; George Johnson, M.D.; Lionel S. Beale, M.B. F.R.S. — With care of In-Patients.
- W. A. Guy, M.B. F.S.S. — With care of Out-Patients.
- Arthur Farre, M.D. F.R.S. — For Diseases of Women and Children, and Physician-Accoucheur.

Assistant-Physicians.
- Conway Evans, M.D.; Alfred B. Duffin, M.D.; E. Symes Thompson, M.B.; E. Liveing, M.D.
- Thomas H. Tanner, M.D.; Alfred Meadows, M.D. — For diseases of Women and Children.

Surgeons.
- W. Fergusson, F.R.S.; Richd. Partridge, F.R.S.; Wm. Bowman, F.R.S. — With care of In-patients.
- Henry Lee, F.R.C.S.

Assistant-Surgeons. — John Wood, F.R.C.S.; John W. Hulke, F.R.C.S. — With care of Out-patients.

Surgeon-Dentist. — S. Cartwright, jun. F.R.C.S.

The Resident Officers, Clinical Clerks, Dressers, &c. are selected by *examination* from among those *Matriculated* Students of the College who are Pupils of the Hospital. No Fee is paid for any of these appointments.

DAYS AND HOURS OF ATTENDANCE.

	M.	Tu.	W.	Th	F.	S.	Hours.	Clinical Lecture.
Dr. Budd	—		—		—		1½ p.m.	Every alt. Monday at 1½ p.m.
Dr. Johnson		—		—		—	1½ p.m.	Every alt. Tuesday at 1½ p.m.
Dr. Beale		—		—		—	9 a.m.	Every Saturday at 9 a.m.
Dr. Arthur Farre		—		—		—	12½ p.m.	
Dr. Guy	—		—		—		1 p.m.	
Dr. Murchison (Winter Sess. only)	—		—		—		1 p.m.	
Dr. Evans (Winter Sess. only)		—		—		—	1 p.m.	
Dr. Tanner (Sum. Sess. only)		—		—		—	12½ p.m.	
Dr. Meadows (Winter Sess. only)		—		—		—	12½ p.m.	
Dr. Duffin	—		—		—		1 p.m.	
Dr. Thompson		—		—		—	1 p.m.	
Professor Fergusson		—		—		—	1½ p.m.	Every alt. Thursday at 1½ p.m.
Professor Partridge	—		—		—		1½ p.m.	Every alt. Friday at 1½ p.m.
Mr. Bowman	—		—				9 a.m.	
Mr. Henry Lee	—		—		—		1 p.m.	
Mr. Hulke (Winter Sess. only)		—		—		—	1 p.m.	
Mr. Wood (Sum. Sess. only)		—		—		—	1 p.m.	
Mr. Cartwright		—			—		10 a.m.	
Vaccination	—						10 a.m.	

FEES.

Perpetual Admission to the Medical and Surgical Practice:—

For Matriculated Students £31 10 0
For those not Matriculated 36 15 0

Medical Practice:—

Three Months	6 6 0
Six Months	10 10 0
Eighteen Months	15 15 0
Perpetual	21 0 0

Surgical Practice:—

Three Months	10 10 0
Six Months	15 15 0
Twenty-one Months	21 0 0
Perpetual	26 5 0

Scholarships.

A. WARNEFORD SCHOLARSHIPS.—The sum of 200*l.* is set apart annually, in consideration of 5,000*l.* presented to the College by the late Rev. S. W. Warneford, LL.D., for Scholarships to Matriculated Students of this Department, viz.—

Class I.—"For the encouragement of the previous education of Medical Students." Two Scholarships of 25*l.* per annum, for three years.

Class II.—"For the encouragement of resident Medical Students." One Scholarship of 25*l.* per annum for two years.

B. COLLEGE SCHOLARSHIPS.—The following are given every year to Matriculated Students of this Department:—

1. One of 40*l.* for two years, open to Students of the third and fourth year.
2. One of 30*l.* for one year, open to Students of the second year.
3. Three of 20*l.* for one year, open to Students of the first year.

C. DANIELL SCHOLARSHIP.—This Scholarship was founded in honour of the late Professor Daniell, and is open to every Student of the College, whether matriculated or occasional, who has worked in the Laboratory for at least six months. It is of the annual value of 20*l.*, tenable for two years.

D. DIVINITY SCHOLARSHIP.—This Scholarship of 30*l.* is also open to Matriculated Students of this Department.

Prizes.

A. LEATHES' PRIZES.—The Interest of 300*l.* bequeathed by the late P. H. Leathes, Esq., is applied in the purchase of a Bible and Prayer-book, as Annual Prizes to two Matriculated Medical Students.

B. WARNEFORD PRIZES.—The sum of 40*l.* is set apart annually in consideration of 1,000*l.* presented to the College by the late Rev. S. W. Warneford, LL.D., and is expended in the purchase of Medals and Books, as Prizes to two Matriculated Medical Students.

C. CLASS PRIZES are awarded annually for proficiency in the several subjects of Anatomy, Physiology, Chemistry, Materia Medica, Surgery, Medicine, Midwifery, Botany, Forensic Medicine, Comparative Anatomy, and Practical Chemistry. These consist of Books of the value of 3*l.*

Certificates of Honour are given to such Students in each class as the respective Professors shall consider entitled to receive them.

Two Medical Clinical Prizes, one of 3*l.* for the Winter Session, and the other of 2*l.* for the Summer Session; and two Surgical Clinical Prizes of the same value, are given also for the encouragement of diligence in attendance at the Hospital.

All Students, *Occasional* as well as *Matriculated*, will be admitted to contend for the Class Prizes C, under rules laid down as to the number of Courses of Lectures. For particulars of all these Prizes see Calendar.

ASSOCIATES OF KING'S COLLEGE.—At the end of each Winter Session, the Professors lay before the Council the names of those Medical Students whom they recommend to be elected Associates of King's College, London. See the College Calendar. Application to be made to the Sub-Dean of the Medical Department, in writing, previous to the 31st of March in each year.

DEGREES.—Students of this College are admitted to Degrees in Arts and Medicine, and for the Honours, Exhibitions, and Scholarships conferred by the Senate of the University of London.

By a regulation of the University of Edinburgh, three out of the four years of study required by that University for its degree of M.D. may be passed at King's College.

RESIDENCE OF STUDENTS.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. See page 21.

Some of the Professors, &c. receive Pupils into their houses. The Council have also sanctioned a limited number of Medical Gentlemen, residing in London or its immediate neighbourhood, to receive Pupils into their houses. See page 22.

The Parents or Guardians of Students are earnestly requested to communicate with the Dean of the Medical Department before fixing their place of residence.

DINING HALL.—There is a Dining Hall in the College, for the accommodation of the resident Students, and for such other Students as may desire to avail themselves of it.

The Sub-Dean of the Medical Department attends daily at King's College, London, from 10 A.M. to 12, for the purpose of seeing Students and their friends. Any letter addressed to him on the subject of this Department, will receive early attention.

RULES

FOR THE

WARNEFORD SCHOLARSHIPS.

The Council hereby give notice, that the following will be the Rules under which Scholars on these Foundations will be elected—

CLASS I.

FOR THE

Encouragement of the previous Education of Medical Students.

TWO SCHOLARSHIPS, of the value of £25 per annum each, to be held for three years, and THREE SCHOLARSHIPS, of the value of £25 per annum each, to be held for two years, will be given in October, 1861, subject to the provisions hereafter stated.

Candidates must be Matriculated Students of the Medical Department, and also perpetual Pupils of the Hospital.

Their first Winter Session must commence in October, 1861.

The Examination will be in the following subjects :—

1. Divinity.—The Book of Genesis. The Gospel according to St. Matthew, in Greek. The Church Catechism, with Scripture proofs.

2. The Greek and Latin Classics.—Xenophon, Memorabilia, Book I.; Ovid, Metamorphosis, Book XIII.; Heroides, Epistola X., Ariadne Theseo.

3. English Language and History.—Burke on the French Revolution. The reign of Queen Elizabeth.

4. Mathematics.—Arithmetic; Algebra, as far as Quadratic Equations; Euclid Book I.; Book II. except Props. 8, 9, 10; Book III.

5. The Modern Languages.—French: De la grandeur et de la décadence des Romains, par Montesquieu. German: Kugler's Geschichte Fredrichs des Grossen.

An equal number of marks is assigned to each of the five subjects. A want of sufficient knowledge in Divinity absolutely disqualifies from further examination; but candidates may omit any other subjects which they think proper.

These Scholarships may be held for three or for two years respectively, provided the Scholar continues so long attending Lectures in the Medical Department at King's College, and provided he shall produce to the Council, at the close of his First and Second Academical Year respectively, a Certificate signed by the Principal, the Chaplain, and the Dean of the Medical Department, (1) of good conduct; (2) of regular attendance on the daily Chapel Service, and (3) the Divinity Lectures; and (4) of satisfactory progress in his Religious and Medical studies during the year then past. The Scholarship will become void at the close of the Academical Year in which such Certificate is not obtained.

For further particulars respecting the Examination, &c. for these Scholarships, see the King's College Calendar.

The days of Examination for 1861 are fixed as follows:—

Saturday, September 28 :—

10 to 3. Divinity. { 1½ hour to each of the three subjects, with short intermissions.

Monday, September 30 :—

9 to 11. Latin.
11½ to 1½ Greek.
3 to 5. French.

Tuesday, October 1 :—

9 to 2. Mathematics. { 1½ hour to each of the three subjects with short intermissions.

Wednesday, October 2 :—

9 to 11. History.
11½ to 1½. English Literature.
3 to 5. German.

CLASS II.

FOR THE

Encouragement of Resident Medical Students.

ONE SCHOLARSHIP will be awarded at the close of the month of July, 1861, of the value of £25 per annum, to be held for two years, subject to the provisions hereafter stated.

This Scholarship is open to all *Second Year* Matriculated Students of the Medical Department, being also perpetual Pupils of the Hospital, who during

At least Six Months of their First Academical Year,
and the
Whole of their Second Academical Year,
} have

resided within the limits of the College, and who produce to the Principal the following certificates; viz. (1) of good conduct from the Censor, or from the Physician or Surgeon with whom he has been residing; (2) of regular attendance on the Sunday and daily Chapel Service, and (3) on the Divinity Lectures, from the Chaplain; and (4) of satisfactory attention to the regular Medical studies, from the Dean of the Department.

The Examination for 1861 will be in the following subjects:—

I. Divinity:—

1. The Prophecy of JEREMIAH, with contemporary histories.
2. The GOSPEL ACCORDING TO ST. MARK.
3. BUTLER'S ANALOGY, Part II. Ch. i. iii. v.
4. THE FIRST SIX OF THE THIRTY-NINE ARTICLES.

II. Candidates will be required, at the time of examination,

1. To write from memory the particulars of four cases which shall have been treated in the Hospital during the previous Academical Year. Each Candidate may select his own cases; but no two cases selected by him may be taken from the practice of the same Physician or Surgeon.
2. To give, in writing, with the aid of notes taken by himself at the time, the substance of four of the Clinical Lectures which shall have been delivered in the Hospital by the Medical Officers thereof during the previous Academical Year. The Lectures to be selected by the Examiners.
3. To answer, either *vivâ voce*, or in writing, as the Examiners may direct, four questions on cases which shall have occurred or been treated within the Hospital in the practice of the Physicians and Surgeons thereof, in the current Session.

N.B. Candidates who have been holding Hospital Appointments in the year preceding the Examination, have the liberty of stating, at the time they give in their names, which of the two Physicians and which of the two Surgeons they have had the opportunity of attending, and they will be examined only in the Clinical Lectures and Clinical Teaching given by such Physician and Surgeon.

An equal number of marks is assigned to each of the two great divisions of the Examination; viz. Divinity and Hospital Practice; but a want of sufficient knowledge in Divinity absolutely disqualifies from further examination.

These Scholarships are tenable only so long as the Scholar continues to attend Lectures in the Medical Department, and to reside within the limits of the College; unless, previously to the expiration of the two years for which the Scholarship is tenable, the Scholar have passed the necessary examinations required by the College of Surgeons and the Society of Apothecaries, or have been excused from further residence by the Council of King's College, for any cause that may to them seem reasonable: provided also that, at the close of his Third Academical Year, each Scholar on this Foundation shall produce to the Council a certificate, signed by the Principal, the Chaplain, and the Censor of the College, and by the Dean of the Medical Department, (1) of good conduct; (2) of regular attendance on the Sunday and daily Chapel Service, and (3) on the Divinity Lectures; and (4) of satisfactory progress in his Religious and Medical studies during the year then past. Unless such Certificate is produced, the Scholarship will become void at the close of that Academical Year.

Residence of Students.

Rooms are provided within the walls of the College, for the residence of a limited number of Matriculated Students.

The Censor of the College, the Rev. J. J. S. Perowne, M.A., Fellow of Corpus Christi College, Cambridge, lives within its walls, and to him is committed by the Council the superintendence of all resident Students.

TERMS AND RULES AS TO PAYMENT.

		Academical Year.	Winter Session.	Summer Session.	Single Term.
		£	£ s. d.	£ s. d.	£
No. 1.	Sitting-room and Bed-room separate	60	45 0 0	20 0 0	22
2.	Ditto ditto ditto	55	41 5 0	18 6 8	20
3.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
4.	Ditto ditto ditto	50	37 10 0	16 13 4	18
5.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
6.	Ditto ditto ditto	60	45 0 0	20 0 0	22
7.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
8.	Ditto ditto ditto	50	37 10 0	16 13 4	18
9.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
10.	Ditto ditto ditto	60	45 0 0	20 0 0	22
11.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
12.	Ditto ditto ditto	50	37 10 0	16 13 4	18
13.	Ditto ditto separate.....	55	41 5 0	18 6 8	20
14.	Ditto ditto ditto	60	45 0 0	20 0 0	22
18.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
19.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
20.	Ditto ditto ditto	55	41 5 0	18 6 8	20
21.	Ditto ditto ditto	50	37 10 0	16 13 4	18
22.	Ditto ditto ditto	60	45 0 0	20 0 0	22
23.	Ditto ditto ditto	60	45 0 0	20 0 0	22
24.	Ditto ditto ditto	55	41 5 0	18 6 8	20
25.	Ditto ditto ditto	50	37 10 0	16 13 4	18
26.	Ditto ditto ditto	60	45 0 0	20 0 0	22
27.	Ditto ditto ditto	60	45 0 0	20 0 0	22
28.	Ditto ditto ditto	55	41 5 0	18 6 8	20
29.	Ditto ditto ditto	50	37 10 0	16 13 4	18

In these amounts are included the *whole* expenses of Rent for Furnished Rooms, Attendance during the Academical Year, Coals during the Michaelmas and Lent terms or the Winter Session, and of Dinner in the College Hall during the time that Lectures continue.

Students have to bring their own linen, and to find their own cups and saucers, &c. for their rooms. These articles, however, as well as bread, butter, tea, sugar, &c. for breakfast, can be obtained through the Manciple of the College, at fixed prices.

All Students, not belonging to the Medical Department, must take rooms for at least two terms upon first coming to reside. Medical Students taking rooms in October, must engage them for the whole Winter Session. The amount may be paid in full upon entrance; or one-half upon entrance, and the remainder at the beginning of the second division of the Session, and not later than January 21. A Student will not be allowed the benefit of the reduction made to those who take rooms for the whole year, unless he declares this to be his intention upon entrance. In this case he will be required to pay *the whole of the Fees for the year* upon entrance, or in two portions, as before mentioned.

Three months' notice is to be given of the intention of any Student to give up his rooms.

In the event of any vacancy occurring, Students will have the preference of changing their rooms according to length of residence in College. Three days' notice will be given in the College Hall of vacancies as they occur.

All fees are payable in advance.

RULES FOR THE GUIDANCE OF RESIDENT STUDENTS.

Quiet, order, decorum, and peaceful conduct must be strictly observed.

Each Student is required to be at home by Ten o'Clock at night, unless absent by leave of the Censor.

No person can be allowed to enter the College for the purpose of visiting a Student after Ten o'Clock.

Friends visiting Students are required to leave the College before Eleven o'Clock. In case of this rule being under any circumstances infringed, the Student must accompany his friends to the gate, and enter his own and their names, together with their address, in a book kept for the purpose by the Porter. Each Student is held responsible for the orderly and quiet conduct of all friends while leaving his rooms, as well as during their visit there.

Resident Students must dine in the College Hall (in their academical dress) every day, except when absent by leave of the Censor.

Names of Gentlemen authorized by the Council to receive Medical Students into their houses as Boarders, under rules laid down by the Council for their guidance.

John Wood, Esq. Demonstrator of Anatomy, 4, Montague Street, Russell Square.
W. B. Gill, Esq. M.D. 5, Cambridge Place, Albany Street.
C. Holthouse, Esq. 9, New Burlington Street.
H. Hyde Salter, Esq. M.D. 6, Montague Street, Russell Square.

Names of Gentlemen authorized by the Council to receive General Literature, Applied Sciences, Military, and Civil Service Students into their houses as Boarders.

Rev. T. A. Cock, M.A. 18, Rodney Street, Pentonville, Lecturer in Mathematics.
H. J. Castle, Esq. 21, Euston Square, Lecturer in Surveying.
J. Summers, Esq. Professor of Chinese, 17, Regent Square.
Rev. A. S. Thelwall, 43, Torrington Square, Lecturer in Public Reading.
Rev. J. O'Reilly, 35, Westbourne Park Villas, Lecturer in Military Science.
C. Tomlinson, Esq. 12, Bedford Place, Hampstead Road, Lecturer on Science in King's College School.
Rev. J. J. Heywood, 22, Bedford Place, Russell Square, Master of the Lower Sixth Class in King's College School.

KING'S COLLEGE,

LONDON.

Evening Classes.

1. Classes for Evening Instruction are held at King's College during the months from October to March, inclusive, and during the months of April, May, and June.

2. The Winter Course for 1860-1 will commence on Monday, October 15, and will terminate on Friday, March 22.

There will be a Vacation of four weeks at Christmas, commencing from after Friday, December 21, 1860.

The second half of the Winter Session will begin on Monday, January 21, 1861.

The Summer Course for 1861 will commence on Monday, April 8, and will continue till the end of June.

3. The following are the subjects of the Winter Course :—

1. DIVINITY.
2. LATIN. (Four Classes.)
3. GREEK. (Four Classes.)
4. FRENCH. (Six Classes.)
5. GERMAN. (Four Classes.)
6. ITALIAN. (Two Classes.)
7. ENGLISH LANGUAGE AND COMPOSITION. (Four Classes.)
8. ANGLO-SAXON.
9. HISTORY } OF ENGLAND.
10. GEOGRAPHY }
11. ARITHMETIC AND BOOK-KEEPING.
12. MATHEMATICS (including Algebra, Euclid, Trigonometry, Differential and Integral Calculus. (Six Classes.)
13. THE PRINCIPLES OF COMMERCE AND COMMERCIAL LAW.
14. DRAWING. (Landscape, Figure, Model, and Architectural.)
15. THE ELEMENTS OF CHEMISTRY.
16. MECHANICS.
17. PHYSIOLOGY.
18. BOTANY.
19. ECONOMIC SCIENCE AND STATISTICS.
20. EXPERIMENTAL PHYSICS.
21. SPANISH.
22. DUTCH.
23. ZOOLOGY.

Many of these Classes have special reference to the B.A. and Matriculation Examinations at the University of London.

If any number of Gentlemen, not less than Ten, shall wish for instruction in

any other subject, such as Hebrew, Mineralogy, &c. arrangements will be made (if possible) to meet their wishes.

4. The following are the Fees for the Winter Session:—

(1.) For any single Course (except Divinity), £1 11*s.* 6*d.* For the Divinity Class only, 10*s.* 6*d.*

(2.) The Divinity Class is free to all Students attending any other Class.

(3.) For any four Classes £5 5*s.*

(4.) In the case of several Gentlemen entering from one Firm or Company, the following will be the fees:—

	For any single Course.	For any four Classes.
If more than five in number,	£1 6 3 each person.	£4 4 0 each person.
If more than ten in number,	1 1 0 ,,	3 7 6 ,,

5. After Christmas, the Fee is reduced to £1 1*s.* for One Class; and to £3 10*s.* for Four Classes. The Fees for the Summer Course are the same.

6. Students who enter to four of the Evening Classes have the privilege of becoming "Matriculated Students of King's College, London," by payment of an additional fee of £2 11*s.* This includes the cost of the College Cap and Gown. Students who matriculate in any one year, paying for four Classes, are retained on the list of Matriculated Students in subsequent years, provided they enter to at least two classes.

Matriculated Students are required (unless specially exempted) to attend the Divinity Class on Wednesday Evening.

7. All Fees to be paid upon entrance. It is important to the College authorities that the entries for each Session should, as far as possible, be made a few days before the day fixed for the commencement of the course, in order that the necessary arrangements as to Lecturers and Lecture-rooms may be properly made; but Students may enter at any time during the Course.

8. A Letter of Introduction, from the Clergyman of the District, from the Student's Employer or the Head of his office, or from some other known person, is, in every case, required upon entrance.

9. The following is the Time Table for the next Winter Course:—

	Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
6 to 7	Mechanics. Botany.	*Mathematics. *English. *Italian. Econ. Science.		Mechanics. Zoology.	*Mathematics. *English. *Italian.
7 to 8	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.	Divinity.	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.
8 to 9	Greek. *German. Arithmetic. Dutch.	*French. History. Anglo-Saxon. Spanish.	Exp. Sciences. Physiology.	Greek. *German. Arithmetic. Dutch.	*French. Geography. Anglo-Saxon. Spanish.

* Students in these subjects may attend either hour on the two appointed evenings; or may take their two hours on one evening; or by the payment of an additional sum of £1 1*s.* (14*s.* after Christmas) may attend both hours on both evenings.

10. The Library of the College is open for the purposes of study to all Gentlemen joining any of these Classes, from 5.30 to 8, every Monday, Tuesday, Thursday, and Friday, without additional fee.

Associates and Students of the regular Departments of the College are admitted to the Library, during the evening, on payment of 10*s.* 6*d.* each.

11. Names of the Gentlemen who give instruction in these Classes:—

1. *Divinity*	Rev. Professor PLUMPTRE, M.A.
2. *Latin*	Rev. C. U. DASENT, M.A. Rev. A. I. MC CAUL, B.A. JOHN LAMB, Esq. Rev. W. HOWSE, M.A.
3. *Greek*	C. H. O. DANIEL, Esq, B.A. Rev. A. I. MC CAUL, B.A. JOHN LAMB, Esq. Rev. W. HOWSE, M.A.
4. *French*	Professor MARIETTE, M.A. Mons. STIEVENARD, Mons. THIBAUDIN, Mons. ISNARD.
5. *German*	Rev. Dr. WINTZER, Herr SCHNEIDER.
6. *Italian*	Professor PISTRUCCI.
7. *English Language and Composition*	HENRY MORLEY, Esq. A.K.C. Rev. O. ADOLPHUS, M.A.
8. *Anglo-Saxon*	HENRY MORLEY, Esq.
9. *History* 10. *Geography* } *of England*	DECIMUS STURGES, Esq. B.A. WILLIAM HUGHES, Esq. F.R.G.S.
11. *Arithmetic and Book-keeping*	JAMES HADDON, Esq. M.A.
12. *Mathematics*	Rev. T. A. COCK, M.A. G. R. SMALLEY, Esq. B.A. T. S. CARTE, Esq. M.A.
13. *Principles of Commerce*	Professor LEONE LEVI.
14. *Drawing*	Professor DE LA MOTTE.
15. *The Elements of Chemistry*	Professor C. L. BLOXAM.
16. *Mechanics*	G. R. SMALLEY, Esq. B.A.
17. *Physiology*	Professor BEALE, M.B.
18. *Botany*	Professor BENTLEY, F.L.S.
19. *Economic Science and Statistics*	Rev. Professor ROGERS, M.A.
20. *Experimental Physics*	Professor MAXWELL, M.A.
21. *Spanish*	Don B. B. AGUIRRE, B.A.
22. *Dutch*	Dr. KÖSTER.
23. *Zoology*	Professor RYMER JONES, F.R.S.

12. THE FOLLOWING WILL PROBABLY BE THE COURSE FOR THE SUMMER SESSION, 1861:—

Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
Chemistry. Greek. German.	Mathematics. Italian.	English. Physiology.	Nat. Philosophy. French. Arithmetic.	Latin. Commerce.

The Hour of Meeting will be 6.30 P.M.; each Class will last one hour and a half.

The Fee for each separate subject will be 1*l.* 1*s.*; for Four Classes, 3*l.* 10*s.*; for Five Classes, 4*l.* 4*s.*

13. Prizes and Certificates.

1. At the close of each Winter Session, examinations are held in each subject; Prizes, and Certificates of Honour and Merit are then given.

2. A Prize will be given to each of the first 5 Students who gain the highest aggregate number of Marks in all the subjects, including Divinity, which they respectively bring up for examination at the end of the Winter Session; provided only that no prize will be given for a less aggregate than 300 marks.

3. In each Class for which not less than 10 Students have entered, there will be offered :—

a. A Prize (or Certificate of Honour at his option) to the Student who shall be highest in the examination.

b. Certificates of Merit (One Certificate to each of the Students next in succession who shall gain not less than three-fifths of the marks allotted to the subject).

4. Whenever a Class is divided into two or more divisions, each division will be treated as a distinct Class, as regards Prizes and Certificates.

5. There is also an examination on each subject at the close of each Summer Session, and Certificates of Merit are then given to all who obtain three-fifths of the whole number of marks.

6. The Prizes and Certificates are open to ALL Students of the Evening Classes.

7. No Prize or Certificate can be awarded, unless earned by—

a. Regular and punctual attendance. *b*. Good conduct. *c*. Absolute merit in the examination.

8. The highest number of marks assigned to each subject is 100. The standard for "absolute merit," which alone will carry a Prize or Certificate of Honour, will be 75. The standard for "Certificates of Merit" is 60.

9. Certificates of having obtained a College Prize, made out under the signatures of the Principal and Secretary, may be obtained by application at the College Office. Fee 2*s*. 6*d*. for each Certificate.

14. Scholarships and Prizes open to all Matriculated Students of the College.

For the conditions on which such Scholarships and Prizes are open to Matriculated Students of the Evening Classes, see the King's College Calendar.

15. The Associateship of King's College, London.

Rules under which this rank is granted to Students of this Department.

A. Regular and punctual attendance on twelve Courses of Lectures, in addition to three Winter Courses of Divinity.

1. The twelve Courses may be taken in any number of subjects taught in the Evening Classes of King's College, being not less than two.

2. A Student must attend at least two Courses in each Winter Session.

3. The attendance must extend over a period embracing at least three Winter Sessions, except in the case of Students entering after Christmas, who may reckon their *time* from the beginning of the Winter Session.

4. Credit will not be given for an attendance on more than four Classes, exclusive of Divinity, in any one Session.

5. The Matriculation Fees (£2 11*s.*) and the Fees for four Courses (£5 5*s.*) must be paid at the commencement of the first Winter Session; but in the event of the Student being unable to attend all the four Courses, he may obtain, by application to the Principal, exemption from one, or at the most two, of them, in which case the difference between the amount due for the Courses he has attended and the £5 5*s.* which he has paid, will be allowed in his second payment.

6. In the case of Students who begin their attendance after Christmas, an attendance on two Courses during the remaining half Session will be held to be equivalent to one Course during the whole Winter Session.

7. The foregoing regulations apply to Courses of Lectures held during the Winter Session; but an attendance on two courses during a Summer Session will be reckoned for one Winter Course.

B. Good conduct throughout the time occupied by the Student's attendance.

C. Attendance at the College Chapel on Sunday Morning during the time that the Student is attending the Evening Classes, unless specially exempted by the Principal.

D. Gaining during the course of time occupied in attendance either

(1.) A Prize;

or (2.) A Certificate of Honour;

or (3.) Two Certificates of Merit. This rule applies to Certificates gained in the Winter Session; but two Certificates gained in a Summer Session will be allowed for one Winter Certificate.

E. Gaining at least half marks in an examination to be held at the time of applying for the Associateship.

(1.) In Divinity.

(2.) In any other three of the subjects taught in the Evening Classes of King's College; these to be selected by the Candidate himself.

F. For the privileges of an Associate, see the King's College Calendar.

G. Students intending, at any future time, to apply for the Associateship, must take out at the close of their first Session a Schedule, on which the fact of their attendance in each class will be recorded. See Calendar.

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16. Further information may be obtained, and Fees paid, at the Secretary's Office, from 10 to 4 daily; also in the Library of the College, after the commencement of Lectures, from 6 to 8 P.M. on Monday, Tuesday, Thursday, and Friday.

17. The Principal, as a general rule, will be ready, after the commencement of the Course, to receive Students for the purpose of registering them upon the College Books, at 6.45 on Tuesday and Thursday evenings.

A detailed Syllabus of the Lectures given during the Winter Session will be found in the College Calendar, price 2s. 6d., or 3s. per post; OR IT MAY BE OBTAINED IN A SEPARATE FORM, PRICE TWOPENCE, *or Threepence per post. Apply to* J. W. CUNNINGHAM, Esq. *King's College, London.*

N.B.—The next day fixed for the admission of new Pupils, is Tuesday, January 22, 1861.

KING'S COLLEGE, LONDON.

The School.

Head Master.—REV. J. R. MAJOR, D.D.

Vice-Master.—Rev. J. FEARNLEY, M.A.

Assistant Masters.

T. S. CARR, Esq. M.A.
Rev. T. O. COCKAYNE, M.A.
Rev. W. HAYES, M.A.
Rev. GEORGE RUST, M.A.
Rev. C. U. DASENT, M.A.
Rev. OTTO ADOLPHUS, M.A.
T. S. CARTE, Esq. M.A.
Rev. J. H. STANDEN, M.A.
Rev. J. D. KINGDON, M.A.
Rev. G. F. MACLEAR, M.A.

Mathematical Master.—GEORGE ROBARTS SMALLEY, Esq. B.A.
Arithmetical and Second Mathematical Master.—J. HADDON, Esq. M.A.
Writing and Second Arithmetical Master.—J. W. LE JEUNE, Esq.
Assistant Writing and Arithmetical Master.—G. E. MORPHETT, Esq.
French Language.—M. THIBAUDIN, Master, and M. WATTEZ and M. ISNARD, Assistant Masters.
German Language.—Rev. A. WINTZER, Ph. D. Master.
Geometrical Drawing.—T. BRADLEY, Esq. Professor.
Landscape Drawing.—P. H. DE LA MOTTE, Esq. Professor.
Lecturer on Science.—CHARLES TOMLINSON, Esq.

King's College School consists of two divisions:—

A. The "Division of Classics, Mathematics, and General Literature."

B. The "Division of Modern Instruction."

A.

Division of Classics, Mathematics, and General Literature.

1. This division is intended to prepare Pupils for the Universities, for the Theological, General Literature, and Medical Departments in the College, and for the learned professions.

2. The regular course of Instruction comprises Divinity; the Greek, Latin, English, and French Languages; Mathematics, Arithmetic, Writing; History, and Geography. Hebrew is also taught to the Upper Sixth Class.

3. German is taught, without any additional charge, to Pupils of the sixth, fifth, and fourth Classes, after the regular School hours, on Wednesday, from ½-past 1 to 3, and on Saturday, from 12 to ½-past 1. Pupils of the lower Classes may learn this Language on payment of 10*s.* 6*d.* per term.

4. Instruction in Drawing may also be obtained by all pupils on Tuesday and Friday, after the regular School hours, on payment of 14*s.* a term, including drawing materials.

5. SCHOLARSHIPS.—Two of 30*l.* (one in Classics and one in Mathematics) for three years; four of 20*l.* (one for each division, and two in Mathematics); two of 15*l.*; two of 10*l.* two of 8*l.*; and two of 6*l.*; are annually given, in the Lent Term, to those Pupils who shall pass the best examinations.

Division of Modern Instruction.

1. This Division is placed under the general direction of the Rev. John Fearnley, M.A., Vice-Master of King's College School, assisted by the Rev. J. H. Standen, M.A., T. S. Carr, Esq. M.A., and by the Mathematical, Arithmetical, French, German, and Drawing Masters.

2. The object in view in this Division is to prepare Pupils for general and mercantile pursuits, for the Departments of Engineering, Architecture, and Military Science in the College, for the Military Academies at Woolwich, Sandhurst, and Addiscombe, and for the Royal Navy and the Commercial Marine.

3. Pupils in this Division take corresponding rank with those in the Division of "Classics, Mathematics, and General Literature."

4. The Mathematical Scholarships, of 30*l.* and 20*l.*, are open to pupils in this Division.

5. The regular course of Education in this Division commences with the Lower First Class.

6. In addition to the regular course of Instruction in the Modern Languages, it has been thought advisable to introduce French and German Conversational Classes, with the view of imparting to the Pupil, by the daily habit of conversation, a facility for expressing himself in these languages, and thereby superseding as far as possible the necessity of a residence upon the continent.

7. Separate Classes are also formed, so as to give special extra Instruction, gratuitously, to boys preparing for any of the following; viz.—

1. Commercial pursuits.
2. Military and Naval studies.
3. Engineering and Architecture.

General Rules and Regulations,

Applicable to the whole School.

1. All boys above the Second Class, (the First and Second Classes being common to both Divisions,) will be placed in whichever Division their parents or guardians shall select. Pupils may at any time be moved from one Division to the other.

2. The general age of admission is from nine to sixteen years.

3. The duties of each day commence with Prayers and the reading of the Scriptures in the College Chapel, from which none of the Pupils are allowed to absent themselves.

4. The periods for the admission of Pupils are, the middle of January; the beginning of May; and the middle of September.

Before entering a pupil, the Head Master must be furnished with a *testimonial of good conduct from the applicant's last instructor*, as well as such particulars with respect to his previous studies as may lead to a correct classification.

5. The Hours of attendance are:—

On Monday, Tuesday, Thursday, and Friday, from..... 9 o'Clock to 3.
On Wednesday, from ..... 9 o'Clock to 1.
On Saturday, from ..... 9 o'Clock to 12.

Pupils who are irregular in their attendance, or inattentive to their studies, will be detained one hour longer, under the charge of a Master; and in each case a letter will be sent to the parent or guardian, stating the cause of the detention.

6. The Vacations consist of seven weeks in Summer; one month at Christmas; and five days at Easter. Pupils are expected to attend the School till the Vacations commence, and to return punctually when they close.

7. There is annually, previous to the Summer Vacation, a public distribution of Prizes awarded by the Council. Examinations for places in the Classes, for promotion, and for Prizes, take place each Term.

8. A Register is kept by the Head Master and the other Masters, of the attendance, employments, and general conduct of the pupils; of which periodical reports are transmitted to their friends.

9. Instruction may also be obtained within the College, in Italian, Chinese, Hindustani, Fencing, Singing, and Dancing.

10. A course of eight elementary Lectures is given each term to each Division, on some subject connected with Art or Science.

11. The terms for the whole regular course of Instruction, in either Division, *including Stationery and the use of Books*, are 7*l.* 15*s.* 2*d.* per Term. There are three Terms in each year.

12. Upon entrance, the Fees for the first two Terms must be paid in advance, together with the sum of 1*l.* 1*s.* for the Entrance Fee, 10*s.* for the use of a Box (5*s.* of which is returned when the boy leaves the School and returns the key), and 2*s.* 6*d.* for the College Calendar, amounting altogether to 17*l.* 3*s.* 10*d.* All fees are payable in advance.

13. Upon entering the Sixth Class, each Pupil is called upon to contribute Ten Shillings to the School Library.

14. *Books.*—The Council having resolved to establish the system of Loan with regard to books, no Boys will be permitted, except those in the Upper Sixth Class, or under unusual circumstances, to bring their own books to the School.

15. A sufficient time, at 1 o'clock each day, is allowed for luncheon, which is provided in the College at a regulated expense.

Those parents who may wish their sons to dine at this hour, may avail themselves of an arrangement made for this purpose in the College Hall. One of the Masters always presides. The expense of dinner is—

£4 5*s.* per Term, for six days in the week.
£3 0*s.* ,, for the Monday, Tuesday, Thursday, and Friday in each week.
0 1*s.* 3*d.* per diem for a single dinner.

N.B. It is earnestly requested that parents will, as far as possible, adopt the system of taking out tickets for four or six days, as the case may be, at the beginning of each term, instead of allowing their sons to make daily payments.

16. Pupils who have been in the School two years, and before leaving it have reached the Upper Sixth Class, are entitled to be recommended for election as Associates of King's College, London, after two years' study in the General Literature, Applied Sciences, or Military Departments of the College, instead of after three years as in all other cases.

17. Pupils may reside with their parents or friends. The following Masters receive Boarders on terms sanctioned by the Council, which may be learnt on application to them, or at the Office of the College:—

Rev. J. R. Major, D.D. 42, Bloomsbury Square.
Rev. T. O. Cockayne, M.A. 16, Montague Street, Russell Square.
Rev. George Rust, M.A. 31, Bedford Square.
Rev. C. U. Dasent, M.A. 68, Guildford Street, Russell Square.
Rev. O. Adolphus, M.A. 15, Tavistock Square.

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18. EXTRA INSTRUCTION,

After the regular School hours, may be obtained in the following subjects:—

		Per Term. £ s. d.	Per Ann. £ s.
German	Rev. A. Wintzer, Ph.D.	See page 28.	
Drawing	Prof. De La Motte	See page 28.	
Fencing	Professor H. C. Angelo	1 11 6	4 4
Drilling	ditto	0 10 6	
Dancing	Edmund Goodwin, Esq.	1 11 6	4 4
Singing	Professor Hullah	1 1 0	
Workshop	G. A. Timme, Esq.	1 1 0	
Photography	T. F. Hardwich, Esq.	See page 11.	

N.B. No Pupil can be admitted to any of these Classes without producing the College Ticket, signed by the Secretary.

Extract *from the* Charter *of* King's College, London.

"That the Council shall have power to accept, on behalf of the said College, gifts and endowments for promoting particular objects of education, or otherwise, in aid of the general purposes of the College, on such terms and conditions as may be agreed on, for the purpose, between the Council and the person bestowing such gifts or endowments."

N.B. The Council will be very glad to receive, under the foregoing clause of their Charter, any sum that may be offered to them for the endowment, in whole or in part, of any particular Scholarship or Professorship.

FORM OF BEQUEST TO KING'S COLLEGE, LONDON.

"*I give to the Corporation of the 'Governors and Proprietors of King's College, London,' the Sum of*
Pounds, (for the general purposes of the said Corporation, or for the foundation of Scholarships and Prizes, open to the whole College, or limited to any particular Department,) to be paid exclusively out of such part of my Personal Estate as I can lawfully charge therewith; and I desire that the said Sum of Pounds be paid, free of all deductions, be the Treasurer for the time being of the said Corporation, whose receipt shall be a full and sufficient discharge for the same."

N.B. Information may be obtained from the Principal or the Secretary as to the particular Endowments most needed by the College, and as to the best regulations to be enacted for securing the objects of the Donor.

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R. CLAY, PRINTER, BREAD STREET HILL.

NOTICE.

The Editor has again to regret the late appearance of the present number of the Journal, and earnestly begs contributors to forward their communications as early as possible.

VOL. I., price 15*s*., cloth 8vo., with **50 Wood Cuts,** and **32 Lithographic plates,** is now ready. Numbers 3, 4, and 5, may still be obtained at the usual price, 3*s*. 6*d*. each.

Each volume is complete in itself, and will consist of not more than four numbers.

Two numbers of the Archives of Medicine are published in the year.

All Subscribers to this Journal are requested to forward their names to the Editor.

TO AUTHORS AND CONTRIBUTORS.

In the last Number a very short analysis of the Contents of the different Works sent to the Editor was given. It is proposed to continue this system. The few remarks offered will be purely *analytical. Critical* notices are inadmissable. If the authors of original papers and essays, will transmit to the Editor a brief and simple summary of the results to which they have arrived, with their printed communication, this department of the Journal will be rendered more complete. Pamphlets and short papers, English and Foreign, on subjects connected with medicine and surgery, which are not generally noticed in reviews, will be included in the summary.

Copies will be forwarded on the morning of publication, post free, to gentlemen who send their addresses, accompanied with a remittance for their subscription, addressed to the Editor, King's College, London.

Subscription, 7s. yearly.

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The following communications have been received, and will shortly be published.

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Diseased pancreas. Mr. Hooper, Aylesbury.

Portion of kidney passed in the urine. Mr. Newham.

Suggestions for recording cases and post-mortem examinations.

Observations on the minute structure and growth of the tissues of animals.

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All communications to be addressed to the Editor, King's College, Strand, London, W.C.